FACTORS AFFECTING HOUSEHOLD FOOD SECURITY: A CASE STUDY OF MTWARA RURAL DISTRICT-MTWARA REGION

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS FOR DEGREE OF MASTER OF ARTS IN SOCIAL WORK OF THE OPEN UNIVERSITY OF TANZANIA

2013

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation titled "*Factors Affecting Household Food Security: A Case Study of Mtwara Rural District-Mtwara Region"* in partial fulfillment of the requirements for the Degree of Master of Arts in Social Work of the Open University of Tanzania.

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Dr. Mary D N Kitula

(Supervisor)

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DECLARATION

I, Daniel Kadeswa Barago, do hereby declare to the Senate of the Open University of Tanzania, that this dissertation is my own work and that, it has neither been submitted nor being concurrently submitted for a similar degree award in any other institution.

Signature

Date

DEDICATION

This work is dedicated to my parents, my beloved late father Stephen Barago Gadiyo, my late mother Maje Gilena Nambololo whom laid the foundation for my education. Secondly, the work is also dedicated to my beloved wife Christina Kasibi Saguya and my children; Anita, Agatha and Allen, who's their love and tolerance, encouraged me to accomplish this academic endeavor.

ACKNOWLEDGEMENTS

First, I thank God for giving me strength in every step during my study. I sincerely express my special thanks to my supervisor Dr. M. Kitula of the Department of Sociology and Social work, The Open University of Tanzania for her professional guidance and tireless efforts to assist me from the initial stage of proposal preparation to the production of this dissertation. I am indeed grateful to my employer, The President's Office for the sponsorship and granting me all financial support which enabled me to undertake this study.

My appreciation is also extended to individuals particularly, District Executive Officer (DED) and District Agricultural and Livestock Officer (DALDO) of Mtwara District Council, for their guidance and cooperation during data collection. Similarly, appreciation is extended to Village Executive Officers (VEO's) of Mtendachi, Madimba, Kitunguli and Mahurunga, Ward Executive Officers (WEO's) from Madimba and Mahurunga wards. Many thanks go to households who actively participated during data collection. Last but not least, my heartfelt and special appreciations go to my wife Christina, my daughters Anita and Agatha and my son Allen for their love for whom they have been my inspiration during my entire period of my academic pursuit. However, any shortcomings of this study are my own weaknesses and should not be directed to those acknowledged.

ABSTRACT

This study examined the factors that affect household food security in Mtwara rural district. The specific objectives were(a) to establish the level of knowledge about food security (b) to establish the level of food production at household level (c) to assess the impact of food insecurity at household level on family members. A case study research design was used in this study. Structured questionnaires, Focus Group Discussions and In-depth Interview from Key Informants were the main instrument for data collection. Both qualitative and quantitative data were processed using Epi Info Version 3.2.2 (2004) soft ware for analysis. The study revealed that, despite 59.9% having excellent knowledge on food security food insecurity still exist. Food production was on subsistence level despite 32.2% having farming experience of more than 10 years. About 90.8% used hand hoe in farming. Further, about 95.5% did not apply agricultural inputs. It was revealed that, 56.8% of all food was sold immediately after harvest. The study revealed that, 75% of storage structures were kitchen ceiling and 24.2% polythene bags. About 79.1% did not treat food before storage. About 33.5% of all food stored food was destroyed during storage, 61.5% lost between 1-200 kg, 27.2% lost between 201-400 kg, 5.2% lost between 401-600 kg while 6.1% lost more than 601 kg. Overall, 46.8% was food insecure. It was concluded that, poor farming technology, excessive selling and poor storage contributed to food insecurity in the study area. It was recommended that, farming technologies and storage structures and techniques should be improved.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
C	Celsius
CAN	Calcium Ammonia Nitrate
DALDO	District Agricultural Development Officer
DED	District Executive Director
DES	Dietary Energy Supply
EAGC	Eastern Africa Grain Council
F	Fahrenheit
FAO	Food and Agricultural Organization of the United Nations
FBS	Food Balance Sheet
FGD	Focus Group Discussion
GDP	Gross Domestic Product
H/H	House Hold
Ha	Hector
HIV	Human Immunodeficiency Virus
IFRC	International Federation of Red Cross
IUCN	International Union for the Conservation of Nature
Kg	Kilogram
LGB	Large Grain Borer
MDSS	Mtwara District Social Survey
Mm	Millimeter
MT	Metric Tone

n	Sample Size
NACP	National Aids Commission Programme
No	Number
NPK	Nitrogen Phosphorous Potassium
NSGRP	National Strategy for Growth and Reduction of Poverty
SA	Sulphate of Ammonia
SSA	Sub Saharan Africa
SSR	Starch Sufficient Ratio
STAT	Statistics
TACAIDS	Tanzania Commission for Acquire Immunity Deficiency Syndrome
TMOH	Tanzania Ministry of Health
Tsh	Tanzania Shilling
UN	United Nations
UNEP	United Nations Environment Programme
UNFPA	United Nations Food Population Agency
URT	United Republic of Tanzania
US	United States
USAID	United States of America International Development
USDA	United States Development of Agriculture
VEO	Village Executive Officer
WB	World Bank
WEO	Ward Executive Officer
WFS	World Food Security

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Problem

Food insecurity in the world has been addressed as one of the biggest problem for over several decades now. One of the reasons for food insecurity in the world is the result of population increase. According to (UN,1999) the world population reached 6 billion and estimated the population will exceed 8 billion by 2025 an increase of 2 billion people in just 26 years. While agriculture production of food remains the same, the increase of population will have an effect on food supply and food security. Food insecurity in the world is the result of inability of the countries to produce sufficient food, inequality of food distribution within the country or for certain commodities, an imbalance of distribution between countries or the inability of certain sectors of the community to obtain a diet of sufficient quality (Robison, 1983). Increasing life standard in the world also put more pressure on food demand. These changes in people's living standard along with population and dietary preferences, largely determine changes in the demand of food (Bender and Smith, 1997).

In developing countries, reasons for food insecurity include insufficient marketing systems, poor transportation and communication networks; weather change, demand-outstripping supply, inefficient food crisis management and resource degradation (IRC, 2008). Food insecurity has affected millions of people worldwide who suffer from hunger.

FAO, (2010), estimates that, one third of world population are lacking food security worldwide and around 925 million people are chronically hungry due to extreme poverty, while up to 2 billion people lack food security intermittently due to varying degrees of poverty. Because of food insecurity, six million children die of hunger every year, 17,000 every day from hunger related causes (UN, 2009, WHO, 2006). In 2010, 17.2 million households, 14.5 percent of households approximately one in seven, were food insecure, the highest number ever recorded in the United States (Coleman-Jensen, 2011).

In Africa, food security is one of the serious problems. Sub-Saharan Africa is the only region in the world where malnutrition, an outcome of food insecurity is not declining. The major challenge to food security in Africa is low fertility soils, and environmental degradation. Ninety five percent of the food in Sub-Saharan Africa is grown under rain fed agriculture hence; food production is vulnerable to adverse weather conditions. The soils continue to degrade leading to a reduction in the productivity of the farms (Mwaniki, 2006).

The spread of HIV/AIDS is also undermining food security in sub-Saharan Africa, including the East African countries of Kenya, Tanzania, and Uganda (FEWS, 2008). Therefore, in regions with high HIV/AIDS prevalence like southern Africa, where subsistence agriculture is the norm, HIV/AIDS-related illness and deaths reduce yields, and less intensive crops being grown. The food crisis is also likely to exacerbate the impact of HIV/AIDS (Hunter, 2008). The consequences of climate change for agriculture and food security in developing countries are of serious

concern, because food supplies are already inadequate and severe in many low-income countries, particularly in Africa. Previous studies have linked climate change to food security and predicted precipitous declines in yields for major African food crops (Schlenker and Lobell (2010), to more modest reductions (Lobell *et al.,* 2008).

Tanzania has been facing food insecurity every year in different parts of the country. The reasons include changes of climate, environmental degradation, gender inequality, poverty and diseases (IFRC, 2008). Tanzania is not drought prone, but food insecurity in the country is both transitory and chronic in nature. For example, in 2009, about 280,000 people (5 percent of the total population) were food insecure; with most parts of the country being classified as overall food secure (FEWSNET, 2009).

In Tanzania, physical access to food is affected by inadequate infrastructure, mainly transportation network affecting access to food by low income rural as well as urban populations (URT, 2006). Poverty rates remain highest in rural areas in which 95% of Tanzania's food is grown under traditional rain-fed agriculture. Given the large proportion of Tanzanian households that rely on farming for their livelihoods and the high rate of rural poverty, this brings further challenge in food production by the overwhelming majority (74%) of poor Tanzanians who are primarily depend on agriculture (URT, 2009).

Food insecurity in Mtwara rural district had been a problem for several years. In 2008/2009 Mtwara rural faced food shortage amounting 5,070 tons (starch 2,765 tons and protein 2,305) out of total food requirements totaling 59,715 tones per year.

The central government provided food aid amounted 668 to households affected (URT, 2009).

1.2 Statement of the Problem

There has been a marked increase of food insecurity in Mtwara Rural District. Despite sufficient food harvest in Mtwara Rural District there has been a continuous increase of food insecurity every year, thus the district has become a regular food aid recipient from the national food reserves. Although food security awareness had been carried out at district and regional level to develop and help peasants to achieve food security yet, food insecurity still prevails in the district. This study will therefore, look into the factors which contribute persistence of food insecurity in the district despite the awareness effort made by government to the current high production of food to suffice the requirement.

1.3 Research Questions

(i) What is the level of knowledge about food security?

(ii) What is the level of food production at household level versus actual food requirement throughout the year?

(iii) What are the factors that lead to food insecurity at household level?

(iv) What are the impacts of food insecurity at household level on family members and related welfare?

1.4 Research Objectives

1.4.1 General Objective

The main objective of this study was to investigate the causes of perpetual food insecurity in Mtwara Rural District.

1.4.2 Specific Objectives

The study was guided by the following specific objectives, namely;

(i) To asses the level of knowledge about food security

(ii) To asses the level of food production at household level versus actual requirement throughout the year

(iii) To identify the factors that lead to food insecurity at household level

(iv) To assess the impacts of food insecurity at household level on family members and related welfare.

1.5 Significance of the Study

This study is significant in the sense that it provides new knowledge concerning proper utilization of food and storage among its rural peasants; hence contribute to the expansion of literature on the problems that affects food security. Secondly, the study is important because it will help the policy makers to improve policy strategies on food security.

1.6 Conceptual Framework

According to (Katani, 1999) a conceptual framework binds facts together and provides guidance towards the collection of appropriate data or information. The conceptual framework applied in this research was the International Fund for Agriculture Development (IFAD) analysis of (Household food security). This conceptual framework was adopted because it resembles issues that are dealt with this study. The framework classifies food security into two areas, that of level and that of shock and the consequent subdivision into problems of acquirement and

utilization which combined to yield a four-dimensional characterization of food security or insecurity.

The identification of determinants has different levels of determinants. Some have a direct effect on one or more of the four dimensions of food security mentioned above, while others work at several levels by operating through other determinants. These determinants are the ability to improve and maintain the level of food acquirement: the endowment set, entitlement mapping and women's control over income.

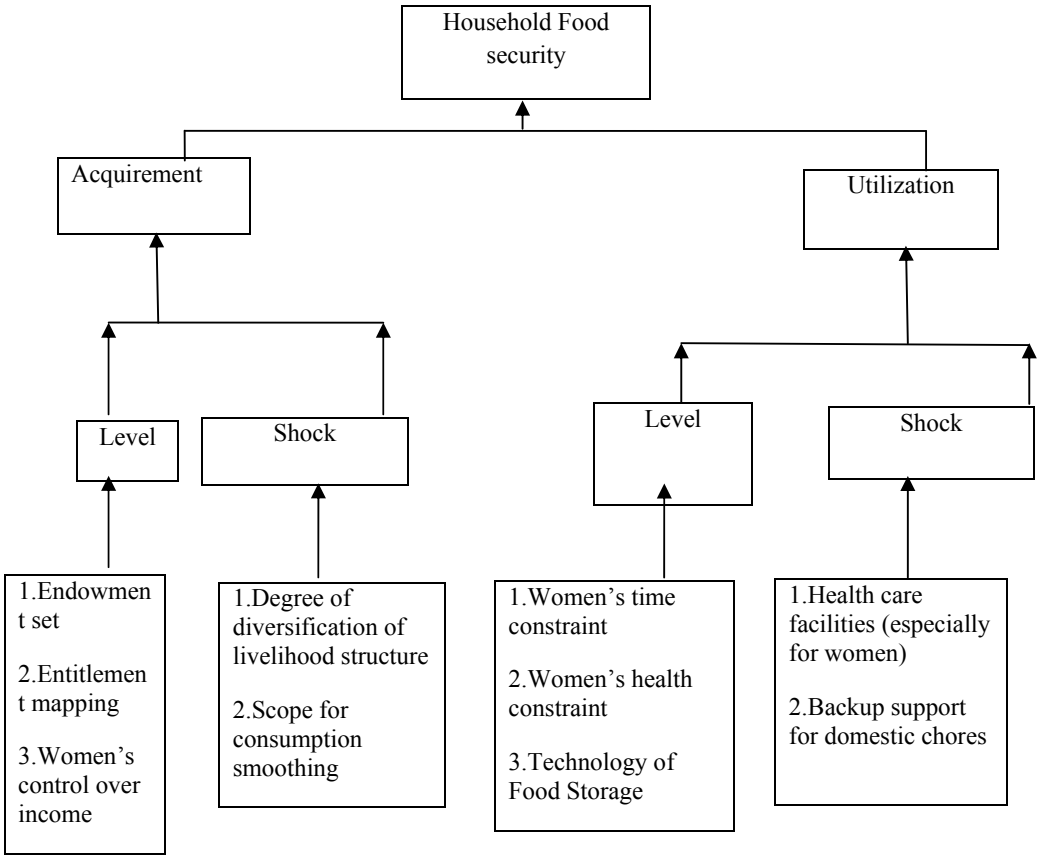

Figure 1.1: Flow Chart of the Determinants of Household Food Security

Source: Adopted from IFAD, (1995)

Another determinant is the ability to cope with shocks to acquirement: degree of diversification of livelihood structure and scope for consumption-smoothing. The level of food utilization includes: women's time constraints and women's health constraints while ability to cope with shocks to food utilization includes: health care facilities and backup supports for domestic chores. This fourfold classification provides a convenient framework for analyzing the determinants of household food security.

1.7 Definitions of Concepts

Food security as an operational concept has, over time, ranged from an emphasis on self-sufficiency to coping with vulnerability and risk in food and nutrition access (Abele *et al*; 2007).

1.7.1 Food Security

Usually defined as being about people having the food they need to live their lives. More precisely, a much quoted definition states: Food security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996).

Food security for a household means access by all members at all times to enough food for an active, health life, (USDA, 2008). Food security involves three components; food availability, food access and food utilization. Food availability implies sufficient production or imports to meet the food needs of the population. Food access refers to the ability of people to obtain food, either through their own

production or by purchasing it with money earned from other sources. Food utilization means that the nutrient intake associated with food consumption is not impeded by inadequate nutritional information, poor sanitation or problems in intra household distribution (Haddad, 1997). Food security for a households means access by all members at all times to enough food for an active, health life (USDA, 2008). However, food security in context of household is defined as the ability of a household to obtain an appropriate level of healthy food needed to sustain activity, and to obtain the food in a socially acceptable fashion (Andrews et al;, 1999). In the context of modern capitalist economies, food access generally indicates issues such as the availability of shopping facilities, available transportation networks, prices and availability of healthy foods, individual knowledge regarding healthy eating, and household budgets (Koralek, 1996).

1.7.2 Food Insecurity

Food insecurity is the state of, or risk of, being unable to provide food (to oneself, a family, a nation, etc) (FAO, 2001). Food insecurity as a situation exists when members of a household have an inadequate diet for part or all of the year or face the possibility of an inadequate diet in the future. Hunger is the uneasy or painful sensation caused by a lack of food (Phillips and Taylor, 1990).

1.7.3 Hunger

Hunger is the recurrent and involuntary lack of access to food that may produce malnutrition over time (Price *et al.,* 1997).

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter presents various studies done by various researchers on the factors affecting food security in the world, Africa and Tanzania in particular. This chapter presents various studies done by various researchers on the factors affecting food security in the World, Africa and Tanzania in particular.

2.1.1 World Food Security Situation

Food insecurity in the world has been increasing each year in different countries although the world produces enough food to feed everyone. World agriculture produces 17 percent more calories per person today than it did 30 years ago, despite a 70 percent population increase. This is enough to provide everyone in the world with at least 2,720 kilocalories (kcal) per person per day (FAO, IFAD, WFP, 2002).

2.1.2 World Food Security and Infrastructures

United Nations (2005), in the report titled "Task Force on Hunger" found that food insecurity in the World is the result of lack of roads and infrastructure which has impact on people's food consumption. That, even in some cereal-surplus countries, there are more underweight children than in food deficit ones caused by food insecurity. The report cited example of India that, it has sufficient food production, and yet very high numbers of underweight children. The report indicated that lack of infrastructure in some countries restricts food availability. However, while food

production has been rising in many countries, availability of sufficient food at the country or local level has not assured that all people are food secure.

2.1.3 Food Security and Biofuel Production

Food prices have been rising for a while and in some countries this has resulted in food riots for example in the case of Haiti and Cameroun in 2008 where food prices increased by 50-100%. Senauer, (2008) in his article on "The appetite for biofuels starves the poor", in relation to decreased food production and rising food prices in the world showed that, the increase of biofuel production instead of food production is responsible for 30% of the increase in the prices of the major grains. That biofuels may be responsible for some 30-75 million poor additional people being driven into hunger.

The increase in the price of oil, which doubled in 2007 and 2008, has resulted in increasing investment in the production of alternative fuels such as those of plant origin. Governments in the United States, the European Union, Brazil and others have subsidized production of agro-fuels in response to the scarcity of oil and global warming. But this green fuel production comes into direct competition with the production of food. To give just one example, in 2007 in the United States 20% of the total cereal harvest was used to produce ethanol and it is calculated in the next decade that this figure will reach 33%.

The findings showed that biofuel production in several countries because of energy demand have decreased the amount of food once produced in those countries have caused food insecurity. However, food prices and food scarcity which is associated

with biofuel production can not be the reason of food insecurity. Food insecurity has been the problem in the world even before the biofuel production and even fuel prices are low.

2.1.4 Food Security and Agricultural Production

FAO, (2002a) issued a report on the Anti hunger programme through a sustainable agriculture and rural development and wider access to food in the world when relating food access showed that, food insecurity in the world has been increasing each year although the world produces more food than is required to provide everyone with an adequate diet. Yet, 800 million people almost one person in every seven do not have enough to eat. Most of these people live in South Asia and sub-Saharan Africa. The report pointed out that, low agricultural production of food crops is responsible for current food insecurity in the world. However, despite that, the world produces enough food to feed the nearly 6 billion people in the world and even more, still this food is not readily available to many millions of people.

2.1.5 Food Prices and Economic Growth

FAO (2010), in their report on "The State of Food Insecurity in the World" Addressing food insecurity in protracted crises reported that, the number of undernourished people in the world remains unacceptably high at near one billion mark despite an expected decline in 2010 for the first time since 1995. This decline is largely attributable to increased economic growth foreseen in 2010, particularly in developing countries and the fall in international food prices since 2008. However, the report showed that a total of 925 million people are still estimated to be

undernourished because of lack of food in 2010, representing almost 16 percent of the population of developing countries. With the fact that, nearly a billion people remain hungry even after the recent food and financial crises have largely passed it indicates a deeper structural problem that gravely threatens the ability to achieve internationally agreed goals on hunger reduction: the first Millennium Development Goal (MDG) and the 1996 World Food Summit goal.

The report demonstrated the evidence that economic growth will not be sufficient in itself to eliminate hunger within an acceptable period of time. That, the present world low food prices and after world economy stabilizes, has not solved the problem of food insecurity despite the fact that, global cereal harvests have been strong for the past several years even as the number of undernourished people is rising. However, while food is abundant in many areas of the world, yet there is lack of significant correlation between this apparent economic growth and improvement in strong harvest while the problem of food insecurity has not been solved in the world to the extent that many millions of people in developing countries are undernourished.

2.1.6 Food Security and Population Growth

FAO (1996), on its report issued at Rome Declaration on world Food Security meeting pointed out that, food insecurity in the world is the outcome of high population increase in the world which creates high demand of food. The report found that, in many developing countries, rapid population growth makes it difficult for agricultural production to keep pace with the rising demand for food. It further demonstrated that, most developing countries already are cultivating virtually all

arable land because of population pressure and are bringing ever more land that is marginal under cultivation because of population growth and hence continues to out-strip food availability in many countries. The report found that, lack of arable land for cultivation continues to out-strip food availability because of population growth. However, in most developing countries arable land for agriculture is still abundant to enable agriculture to produce enough food especially Africa where it is estimated to hold 60 percent of the world's remaining uncultivated land, yet food insecurity still persist particularly in developing countries.

2.1.7 Food Security and Poverty

FAO (2003), issued a report about Anti hunger programme, a twin track approach to Hunger Reduction when relating food insecurity with poverty, stated that, three quarter of the poor in developing countries live in rural areas, and rapid poverty is partly due to decline of agriculture in the rural sector. That, around 852 million people worldwide are chronically hungry due to extreme poverty, while up to 2 billion lack food security intermittently due to varying degree of poverty. Extreme poverty remains an alarming problem in the world's developing regions, despite some progress that reduced in poverty has been concentrated in Asia, and especially, East Asia, with the major improvement occurring in China. In Sub-Saharan Africa, the number of people in extreme poverty has increased.

Government of India (2005), issued a report on "Economic Survey 2006-2007" prepared by National Household Survey of India in 1999-2000 in relation to food accessibility. It was estimated that, about 291 million individuals in India are below

poverty line hence limits economic access to food. That, 30.2 per cent for rural areas and 24.7 per cent for urban areas are below poverty line despite that India produces over 206 million tons of food and has grain reserves in the warehouses up to 21 million tons. Yet millions of people suffer from grain insecurity. The report revealed that the capital availability of food has declined to 390 grams per day in 2006 against a requirement of 510 grams per capita per day.

Suresh and Stacey (2006), in the report about India consumer and producer price policy: Implications for food security showed that food insecurity in India is currently on access as sizable share of the population lacks economic and physical access to sufficient food**.** All the reports demonstrated that, food insecurity is basically a problem of poverty, affecting those social groups with the weakest or most fragile food entitlements, both in terms of access to capital, land and agricultural inputs.

However, the statement that poverty is the principal cause of hunger is, though correct, unsatisfying. India like other many countries including developing nations have put several measures to reduce food poverty resulting from market driven economic development including high food production, yet, despite producing food in millions of tons and having huge food reserves, none of these measures have sufficiently ensured adequate food for all.

2.1.8 Food Security and Disasters

Frequent disasters and food accessibility in some countries in Asia have affected food security**.** Shengjun (2004), in his article about Grain Key to China's Success in

achieving National Stability when relating food security and national stability showed that, in China where grain supply capability exceeds demand nationwide, which allows it to feed 22 per cent of the world population. Between 2000 and 2003, for four years, it faced decline in grain production due to series of national disasters and reduction of available land. The gap in food production has been around 15-20 million tons per annum which raised bells in China for increasing grain production as soon as possible. However, though natural disasters may affect food security in multiple ways, natural disasters occur in periods in certain locality in some countries is not a major reason that undermines agricultural activities in terms of food security. This is because in countries where hardly experiences natural disasters, the problem of food insecurity has been a problem for decades.

2.2 Food Situations in Africa

Food security in Africa is still a big problem particularly in sub- Saharan Africa. Several studies have shown the causes of food security in Africa are multiple and complex.

2.2.1 Relation between Food Security and Poverty

DFID (2002), in the report about Eliminating hunger in relation to agriculture and poverty in Africa showed that higher agricultural production can improve food security by decreasing food prices for consumers, increasing rural incomes and contributing to economic development. That, studies show a 1% rise in per capita agricultural output led to a 1.6% rise in incomes of the poorest 20% of people. The report signified that, increasing agricultural production will increase food security as

well as eliminating poverty. However, though agricultural production have increased in terms of food production in some countries, the issue of eliminating food insecurity and poverty through agriculture alone have not achieved by increasing agricultural productivity.

2.2.2 Food Security and Low Agricultural Productivity in Africa

FAO, (2000) in its report on "The Elimination of Food insecurity in the Horn of Africa" revealed that, The Horn of Africa is one of the most food-insecure regions in the world. The region as a whole has more than 40 percent of people who are undernourished, and in Eritrea and Somalia, the proportion rises to 70 percent. The seven countries of the region, Djibouti, Ethiopia, Eritrea, Kenya, Somalia and Sudan have a combined population of 160 million people, 70 million of whom live in areas prone to extreme food shortages. That crop yields in the Horn of Africa are among the lowest in the world. The report showed that, food insecurity to those countries is largely due to inadequate water control, as less than 1 percent of cultivable land is irrigated, compared with 37 percent in Asia. Moreover, they usually have very little land. The report found that over the past 30 years, these countries have been threatened by famine at least once in each decade. However, among those countries Sudan, Kenya and Uganda, have the vast fertile soils, numerous water basins and rivers like many other countries in sub-Saharan Africa, and yet, all these opportunities has not automatically solve the food insecurity situation.

2.2.3 Food Security and HIV/AIDS in Africa

FEWS (2008), in its report about East African countries "Food Security Framework: Underlying Factors" found that the spread of HIV/AIDS and other diseases is

undermining food security in East African countries. That, in Kenya, Uganda, and Tanzania, more than 5 percent of the working-age population is infected. Furthermore, subsistence agriculture relies heavily on human labour, particularly women's labour. Therefore, the report found that, in regions with high HIV/AIDS prevalence like southern Africa, where subsistence agriculture is the norm, HIV/AIDS-related illness and deaths reduce the agricultural labour force, resulting in less land being farmed, reduced yields, and less intensive crops being grown.

Hunter (2008), conducted a study in Kenya about "Understanding How HIV/AIDS, Agricultural Systems, and Food Security Are Linked," found that the death of an adult female household member resulted in fewer grain crops grown, while the death of an adult male resulted in decreased production of cash crops such as sugar and coffee. Household income may fall if the infected individual was a wage earner, and expenses may increase because of new health care costs.

The redistribution of money for medicine and funeral expenses by afflicted households reduces the income available for food and investments to improve agricultural production. Food production is also threatened by the loss of agricultural knowledge when infected individuals die. The food crisis is also likely to exacerbate the impact of HIV/AIDS as infected individuals, who have heightened nutritional needs, find it more difficult to purchase foods. However, though HIV/AIDS is responsible for weakening agricultural labour force to affected individual households, the problem of food insecurity has going on and to millions of the household members despite having good health.

2.2.4 Food Security and Conflict

United Nations Millennium Project (2005), in its report concerning "Investing in Development in A practical plan to achieve the MDGs" in relation to attainment of food security before 2015 stated that, conflict can be both a cause and result of food insecurity in Africa. That, out of the 34 countries furthest from reaching the MDGs, 22 are in or just coming out of conflict. The report indicated that, in Somalia due to political conflict, food insecurity figures exceeds those reported in Niger in 2005, Ethiopia in 2001, and in Sudan 1998, making it the most severe food security crisis in Africa since the 1991/92 Somalia famine. However, though conflicts in African has an immediate effect on the disruption of food production and distribution systems, food insecurity has been occurring in many African countries even with the countries with political stability in several decades.

2.2.5 Population Growth and Food Security

UNEP (2002), in its report on "Africa Environment Outlook, Present, Past and future Perspectives" related food security and Africa population growth and showed that, Africa remains the world's fastest growing region, at an estimated 2.4 per cent per annum and the region will attain an estimated population of 1,406 million by the year 2030. The report stated that, when population is rocketing every year as compare with food production, Africa with one-quarter of the world's arable land produces only 10 percent of its total global output with more than 265 million people still chronically hungry. The report indicated that, high population increase in Africa as one of the reason of food insecurity. However, population growth itself is not the problem alone that contributes to food insecurity, rather it is a challenge. For

example, China has a larger population than the entire African continent, yet the Chinese can still feed themselves. While Africa has all the resources to produce enough food, yet the continent has a number of millions of people who are food insecure.

2.2.6 Relationship between Food Security and Gender

Meena (1992), in her study about "Gender in Southern Africa: Conceptual and Theoretical Issues" reported that, while women in Africa constitute the majority of agricultural producers, and are mainly responsible for food production, governments have done so little to ensure their access to land. That, women lacking right to own land in most African country has created food insecurity. The study findings demonstrated that problem of women lacking one of the factors of production, land, is one of the factors that hinder production of food by women in rural areas. However, gender equality has been implemented in Southern Africa countries including political and technical solution in recent years to empower women including owning land. Despite these numerous governments' efforts to bring equality between women and men in owning land, food produced have not solved the problem of food insecurity to rural women despite equality in land access.

2.2.7 Food Security and Climate Change

Schlenker and Lobell (2010), in their study about "Robust Negative Impacts of Climate Change on African Agriculture" reported that, the consequences of climate change for agriculture and food security in Africa are of serious concern, not least because food supplies are already inadequate and poverty severe in many low-

income countries, particularly in Sub Saharan Africa. Moreover, many low-income countries are considered to be most vulnerable to climate change, mainly due to their reliance on rain-fed agriculture. The findings showed that, previous studies linking climate change to food security have typically used agricultural crop models and their predictions range from precipitous declines in yields for major African food crops to more modest reductions.

IFRC (2008), in the report on "Long term Food Security Investing in Peoples" in relation to five strategic framework on food security for Africa showed that, environmental degradation and climate change are the causes of food insecurity in Africa. The findings demonstrated that, environmental degradation has caused soil erosion, loss of nutrients, damage from inappropriate farming practices, and the misuse of agricultural chemicals. Such factors have profoundly impacted on traditional livelihood to the already economically weak households making them unsustainable, and, put them in constant crisis and restricting their ability to access sufficient food. All the reports indicated that, climate change and environment degradation is responsible for declining of food production in Africa. However, while Africa has more arable and fertile land than any continent with reasonable rainfall pattern per year, yet the issue of food insecurity has continued despite that most country in Africa have good and conducive environment climate for agriculture.

2.3 Food Security in Tanzania

Since 1972 to the present, the government of Tanzania has made several policies, declarations and carried out a number of campaigns, programs and reforms in an

attempt to scale up growth in the agricultural sector, the Government, in collaboration with other stakeholders, undertook a number of policy, strategies, and programme measures. Some of these measures are well articulated in Agricultural Sector Development Programme (ASDP) and more recently in KILIMO KWANZA strategic document. All the objective of these measures aims at attaining food security.

2.3.1 Food Security and Diseases in Tanzania

TACAIDS, (2007) issued a report about Tacaids follow up and Assessment on HIV and AIDS and reported that nearly 2.4 million people to be HIV infected and 800 people to have AIDS. That the prevalence of HIV/AIDS pandemic accounts 7% among adults, poses serious public health problem, second only to malaria and it greatly affects the health and social-economic progress-reducing life expectancy, contributing to, and exacerbating food shortages. The problem of food insecurity in most of Tanzania's rural and urban areas, have forced the marginalized groups to be in risk of contracting diseases such as HIV/AIDS, and the effect is massive depopulation to energetic young generation that are vital in producing food in agricultural sector.

FAO (2006), in its report on HIV and Food Security showed that HIV/AIDS pandemic in sub-Saharan Africa is depleting the region of its food producers and farmers, decimating the agricultural labour force for generation to come. Apart from HIV/AIDS pandemic, Tanzania population is still affected by numerous deaths as the outcome of malaria which kills more people even than HIV/AIDS.

Both reports demonstrated that, the two diseases, HIV and malaria are threat to food security in Tanzania population in which both causes multiple deaths and therefore affects millions of households in terms of food production. Therefore, the deaths decreases population size leaves tens of orphans, sweeps away young and skilled productive labour force without mentioning the time of treating sick at the household level. However, though the diseases may be associated with incidence of food insecurity, there has been a reasonable improvement in the fight against these two diseases in the country to the extent that food production has stabilized. Despite attainments of food production in the country, a number of household are food insecure.

2.3.2 Food Security and Population Growth in Tanzania

United Nations (2009), on World Population reported that, in 2003 the population of Tanzania was estimated by United Nations to be reach 36.9 million people which placed it as number 32 among the highest in population increase out of 193 nations of the world. The report indicated that, rapid population increase in Tanzania has become one of the factors of food insecurity due to high demand of food as compared to low production of food. It showed that, uncontrolled population with low or absence of sufficient food brings a negative effect to food security to the household.

However, population growth itself does not cause food insecurity. While Tanzania has taken several measures to ensure sufficient food production to meet the demand of the increasing number of population, particularly in the household level by

removing constraints that hinders food production, food production has improved in many parts of the country, yet, there are pockets of food insecure population countrywide each year.

2.3.3 Climate Change and Food Security

Aman (2004), in his study about "Agricultural Development and Food Security in Sub-Saharan Africa" Tanzania Country Report found that, over dependence on rain fed agriculture has been a major constraint to sustainable increase in crop production. The report showed that, while there is an abundance of water in rivers and lakes in Tanzania, there is very limited application of irrigated agriculture. That in rural areas with long dry seasons, in particular Dodoma, Singed, Shinyanga and some parts of Arish and Tanga regions exhibit food insecure because they continue depending on rain fed agriculture. The report demonstrated that, these regions fail to meet food requirements from domestic production in two out of every five years.

URT (2006), in its report about "Strategy for Growth and Reduction of Poverty" in relation to food security showed that, in August 2005 the proportion of districts reported to have food shortages in Tanzania was 29 per cent (34 districts). And in January 2006, due to prolonged drought conditions, this per cent had risen to 65 percent (77 districts). That Tanzania has been facing a worsening food security situation following poor harvest in both 2002 and 2003 cropping seasons as a result of inadequate rainfall.

USAID (2009), in their report about "Current Food Security Conditions" in relation to Tanzania Food Security reported that, food security conditions deteriorated in

northern and northeastern parts of the bimodal areas, in the Lake Victoria zone Mara, Mwanza and Shinyanga Districts. That, in some parts received below-normal rains, including the central zone of Dodoma and Singida Regions, and some parts of the lowland areas of the southern highlands Iringa and Mbeya Regions and southern regions of Mtwara and Lindi. The reported revealed that, in March 2009 across the country, 279,607 people were food insecure in 40 Districts (in 11 regions), in September 2009 there were over 1.5 million food insecure people in 63 districts in 15 regions.

The report indicated that, food insecure population increased between the two periods mainly because of poor food production resulting from changes of weather. All the reports found that, food insecurity in the country is due to climate changes in recent years that are responsible for decline of food production as a result of depending on rainfall in agriculture. However, despite the effects of climate changes in some parts of Tanzania in relation to food production, food production has been increasing marginally and in some years exceeded the theoretical overall food requirements. Yet, the problem of food insecurity has continued in different parts of Tanzania for many years now.

2.4 Lessons Learnt from Literature Review

From the literature review, it shows that the problems of food insecurity are a great phenomena and the research done in Tanzania and other countries worldwide indicate that food insecurity and hunger still exists among the households. Most researchers, who researched on this area, approached the issue on general factors

such as food prices, infrastructures, conflicts, diseases, poverty, low production, climate change and population increase. However, these approaches did not come up with crucial factors that affect household food insecurity for many years now in Mtwara District. Therefore, there is an urgent need to research the problem in order to find the causes for the purpose of finding solution to the problem.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

The aim of this Chapter is to provide the details of all the procedures used in this study. The Chapter is divided into five sections: Section one presents research design used, Section two presents Study Area, Section three presents the Sampling Techniques used to determine cases to be involved in the study. Section four presents Data Collection Methods and Section five presents Data Analysis Techniques.

3.1.1 Research Design

A case study research design was adopted during data collection. This case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources that narrow down a very broad field of research into one easily researchable topic. This ensures that the issue is not explored through one lens because of its ability to investigate a phenomenon in depth and within its real-life context which give result in the formulation of important principle of knowledge and solution to significant problem.

3.1.2 Study Area

This study was conducted in Mtwara Rural District. This district is one of the six districts of Mtwara Region. The Mtwara Rural District has 6 divisions, 28 wards, 157 villages, and 637 hamlets with 54,000 households. Basing on 2002 census data, Mtwara District had a population of 204,770 people. In 2010 the district was estimated to have a population of 228, 860 people with a growing rate of 1.4%

between the years 1988-2002 (URT, 2005; URT, 2004). The District lies between longitudes 39^{o} 0" and 40^{o} 27" east of Greenwich. It is also situated between latitudes 10^{o} 0" and 10^{o} 07" south of the equator. It bordered the Indian Ocean to the East, Lindi region to the North, Tandahimba District to the West and Republic of Mozambique to the South. It covers an area of 3597 square kilometers which is 21% of the total area of Mtwara Region (URT, 1997).

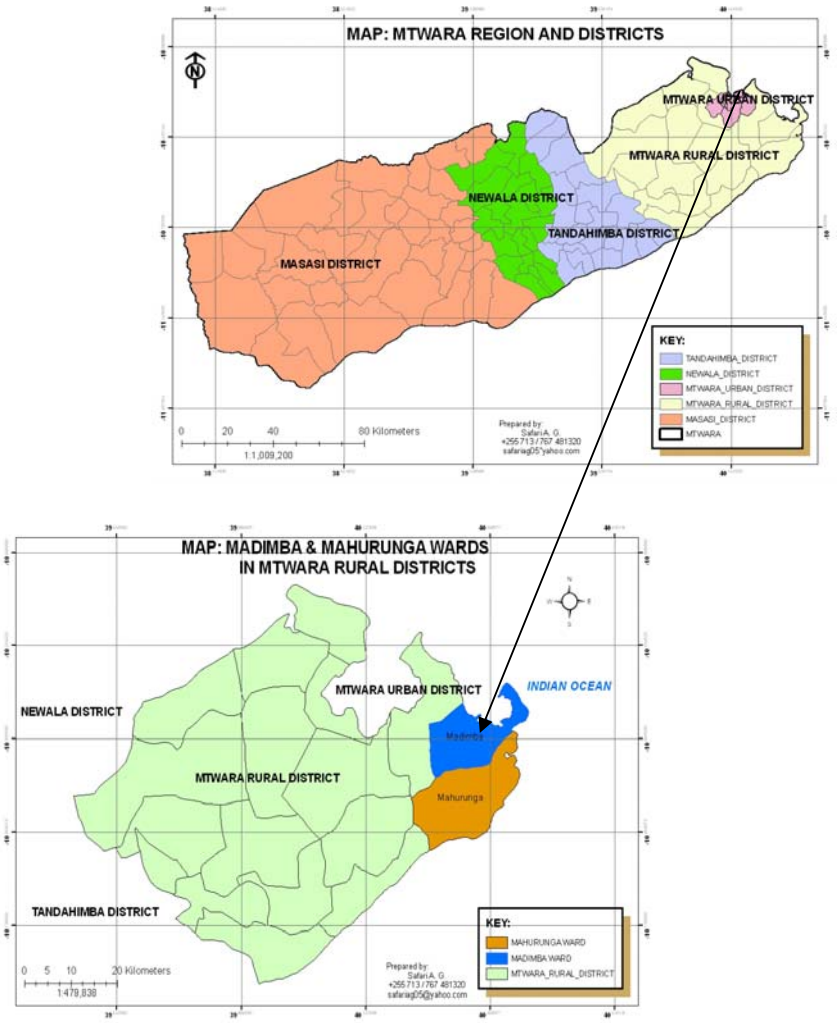

Figure 3.1: Map of Mtwara Rural District showing Study Area

Source: Field Data

Mtwara Rural District was selected due to the fact that for many years, the district has been one of districts in Mtwara Region producing enough food per year, and yet, still there existed food shortage among the households.

3.1.3 Study Population

The population sample for this study was drawn from the head of the households of Mtwara Rural District. In this study, the household were treated as sampling units, whereby it is defined as a group of people eating from the same pot, cultivating the same land and recognizes the authority of one person, the household head who is the ultimate decision maker of the household, (Poat and Daplyn, 1988) cited by Mbwambo, (2007). Household is also a group of persons who lived together and shared living expenses; usually these are husband, wife and children (URT, 2002).

3.1.4 Sampling Techniques

In undertaking the study, two sampling techniques were used, namely purposive sampling and random sampling.

(a) Purposive sampling

Purposive sampling was done at two levels. First, selecting research site (i-e, villages, wards and as this case two wards and four villages were purposively selected). These wards were Madimba and Mahurunga. Among these wards, two villages were also selected (i.e. Mtendachi and Madimba in Madimba ward, Mahurunga and Kitunguli villages in Mahurunga ward). These sites were selected because they were among several villages which had suffered food shortage. At the

district level, Mtwara rural district was selected. At the ward level, purposive sampling was employed to select respondents who were strategically well placed to give its information concerning the problem. In the district level, included District Executive Director (DED), District Agricultural and Livestock Officer (DALDO), while in the Ward included Executive Officers (WEO's) and Ward Agricultural Extension Officers.

(b) Random sampling

The random sampling was used to obtain the sample in the study area. Firstly, simple random sampling was used to select two divisions out of six divisions in the district. Secondly, the two divisions were randomly sampled to obtain three wards from each division which formed six wards. Thirdly, a list of six wards was subjected to the random sampling to obtain two wards, one from each division.

Fourthly, the two wards were drawn randomly using village register as sampling frame to select two villages from each ward making four villages. Fifthly, the four villages were randomly sampled to select number of households. Sixthly, from each household sampled, only head of a household was interviewed. The questionnaire was administered on individual household basis whereby the head of household whether a man or a woman were interviewed. The purpose of using simple random sampling technique was to select the heads of households in order to avoid bias.

3.1.4.2 Sample Size

The optimum number of household (n) sampled in the study area was 54,000 households. Sample size was calculated with assumption that the proportion of the

household head will be 50 per cent. In order to obtain a reasonable sample size the maximum error was assumed to be 0.072 per cent and a significant level (α) of 5 per cent. The confident level was 95 per cent. The following formula was applied, (Cochran, 1977).

$$n = \frac{NZ_{\frac{\alpha}{2}}^2 Pq}{(N-1)e^2 + Z_{\frac{\alpha}{2}}^2 Pq}$$

Where α=0.05, p=0.5, q=1 and *e*=0.072

n= sample size

N= total number of household who enrolled in the MDSS

$Z_{\frac{\alpha}{2}}$ = is a constant coefficient (i.e. multiplier) associated with the confidence level that was used. (This has to be looked up in a statistical table), for the 95 percent confidence interval, $Z_{\frac{\alpha}{2}}$ = 1.96. Using the 95 percent confidence interval above, the formula gave 185 numbers of households. Ideally, the sample size was supposed to be 185 respondents but due to limited time and financial constrains, alternative procedures for sample determination recommended by Akitanda (1994), was adopted. According to Akitanda (1994), the minimum size of sample unity for a population ought to be not less than 30 for each sampling category. Thus, 30 respondents were randomly selected from four villages, two villages from Madimba ward and two villages from Mahurunga ward; hence making a sample size of 120 respondents. The following formula was applied:

$$n = \frac{NZ_{\frac{\alpha}{2}}^2 Pq}{(N-1)e^2 + Z_{\frac{\alpha}{2}}^2 Pq}$$

Where α=0.05, p=0.5, q=1 and *e*=0.089

n= sample size

N= total number of households

 = is a constant coefficient (i.e. multiplier), 95 percent confidence interval,  = 1.96. Using the 95 percent confidence interval above, the formula gave 120 numbers of households.

Table 3. 1: Household Sampled for Questionnaire Administration

Ward	Village	Total number of H/H	Household sampled	Total Percentage
Madimba	Mtendachi	300	30	10.0
Madimba	Madimba	440	30	6.8
Mahurunga	Kitunguli	490	30	6.1
Mahurunga	Mahurunga	586	30	5.1
Total Sample		1816	120	6.6%

Source: Field Data

3.2 Research Phases

The study was carried out in two phases; namely reconnaissance survey and data collection. The purpose of reconnaissance survey was to familiarize with the study area and to conduct questionnaire pre-testing. Questionnaires were administered to eight households in Msimbati village to examine its validity and reliability and final necessary modification were made as suggested by Kajembe (1994). These phases were also useful in obtaining information on population size, socio- economic activities as well as inter training of research assistant.

Ethical Considerations including permission to carry out the research study was sought from The Open University of Tanzania and from District Executive Officer of

Mtwara District. Informed consent was sought from all the study participants. Confidentiality, anonymity and privacy were fully guaranteed to all participants in the study area. Therefore, all the objectives of this study were considered in this preliminary survey.

3.3 Data Collection Methods

3.3.1 Questionnaires

Questionnaires were the main tool for data collection. This tool was used to collect primary data from household respondents using both structured and semi-structured questionnaires (open and close-ended). The total number of households head in the study area that were involved in questionnaire administration in the four villages was 120 as shown above in Table 3.1. In this study, five percent sampling intensity were employed as the minimum to select number of household from four villages. The five per cent intensity is regarded to be a good representative sample in many social surveys (Kajembe and Luoga, 1996; Saunders *et al.,* 2007).

The questionnaires techniques was selected because of its ability to elicit information about household characteristics and because it can help to collect information within short time. Under closed- ended questionnaires respondents were given alternative answers while open -ended questionnaires helped to accommodate respondent's views, ideas and opinions through free explanation as suggested by Goldman and MacDonald (1987) and de Vaus (2002). Therefore, open-ended questionnaires improved the purpose of disclosing the system of knowledge and structuring of ideas of respondents whereby own views concerning the study problems were discussed.

3.3.2 Focus Group Discussions (FGD)

A total of four focus group discussion was conducted in each of the four villages (Mtendachi and Madimba) in Madimba ward, (Kitunguli and Mahurunga) in Mahurunga ward involved 40 participants. A sample of 8 to 12 individuals participated in each village. Composition in the FGD was almost equally represented by gender and all social groups which included Village chairperson, peasants, fishers, elders, youth and community local leaders in each village who were not involved in quantitative data collection methods. The FGD was useful in acquiring information on certain topics of interest to this study.

3.3.3 In-depth Interviews from Key Informants

In depth interview was conducted to gather qualitative information from key informants regarding all aspects of the study. According to Booth *et al*; (1998), qualitative methods are often more appropriate for capturing the social and institutional context of people's lives than the quantitative methods. A key informant person is an individual who is knowledgeable, accessible and willing to discuss about the issue under the study concerned (Mbwambo 2000). In this study, key informants from district level included District Executive Director (DED), District Agricultural and Livestock Officer (DALDO). From the Ward level key informants included Ward Executive Officers (WEO's) and Ward Agricultural Extension Officers from two surveyed Wards while in the Village level key informants included Village Executive Officers (VEO's) from four Villages surveyed. Therefore, this method was applicable for all objectives of this study due to the fact that all important supplementary information was asked.

3.3.4 Desk Review

This was useful at the early stage in conceptualizing and developing my research proposal. Desk review data were derived from existing information/literature. This included different reports from various government and other non-governments offices (e.g. Mtwara Social Economic Profile). Books (e.g. Mmari, U. Hawasa, F. and Kinyashi G. (2010), Factors Affecting Household Food Security in Planned and Unplanned Settlements; Empirical Evidence from Dodoma, Mwaniki, A. (2006), Achieving Food Security in Africa: Challenges and Issues). Journals (e.g. Hadley, C. Patil, C. (2006), Food Insecurity in Rural Tanzania, Hardley, C. Borgerhoff, M. and Fitzherbert, E. (2007), Seasonal Food Insecurity and Perceived Social Support in Rural Tanzania. Research reports (e.g. Amani H. (2004), Agricultural Development and Food Security in Sub Saharan Africa. Tanzania Country Report). Census reports (e.g. URT, (2005), 2002 Population and Housing Census, village and street statistics, age and sex distribution, Mtwara Region vol. vii., URT, (2002), Tanzania National Census Report. Other data were derived from Internet sources and newspapers provided data for this study.

3.3.5 Data Analysis Techniques

After collecting data, raw data were sorted, coded, verified and separated according to wards surveyed. Data were pre-processed by identifying problems that were in the raw data by correcting and elimination of unusable data including interpretation of ambiguous answers and contradictory data from related questions. A coding system was developed and refined to facilitate sorting and reviewing data. Both qualitative and quantitative data were entered to the computer code sheet for processing using

Epi Info Version 3.2.2 (2004) soft ware for analysis. Quantitative data or numeric variables were discrete variables and continuous variables which included nominal, ordinal; interval and ratio. Descriptive statistics such as mean, frequencies and percentages were presented using charts, graphs, and frequency tables to describe and summarize the data.

Qualitative types of data or attribute variables were binomial variables and categorical variables. Qualitative data were analyzed by grouping the data into themes. Thematic analysis was used on examining themes within data. The themes were used to group the data into thematic groups and the meaning of the themes was analyzed and connected them back to the research question(s). Coding was created to develop themes within the raw data prior to interpretation.

The analysis of these codes was made by comparing theme frequencies, identifying theme co-occurrence, and graphically displaying relationships between different themes. The themes become the categories for analysis and presented by using descriptive statements.

Other data for the qualitative part of the study was collected using focus group discussion. In addition, key informant interviews were conducted among Village, Ward and District officials. Data collected were sorted, and developed coding categories to identify key issues taken from field notes in order to identify data that are related. The coding was used to eliminate, combine, or subdivide coding categories, and looks for repeating ideas and larger themes that connect codes and was presented using quotations and descriptive statements.

3.4 Limitations of the Study

In the course of conducting this study, the researcher encountered the following limitations:

(i) First, majority of the respondents (47.5%) were illiterate who created difficulties during the interview process. This was counteracted by participant observation and exhaustive clarification was provided.

(ii) Second, there was a problem of data recalling which depended on the respondent's capacity to remember past events. For example, there were notable difficulties for respondents to give actual calculation of amount of food requirements, amounts of produced or lost. This problem was minimized by clarification obtained from Village Executive Officers, Key Informants and Focus Group Discussion. Furthermore, Kajembe (1998) cited by Kigula (2006) pointed out that, the information based on memory cannot be reliable but if no records exist it may be the only way to get at least an idea of change.

CHAPTER FOUR

4.0 THE FINDINGS OF THE STUDY AND RELATED DISCUSSION

4.1 Overview

The results are classified into seven categories. First, demographic characteristics of the household heads are presented and discussed. The second category is an analysis of farming system and land use. The third category is an assessment about the knowledge on food security at household level. The fourth category is about the production at household level, while the fifth category is an analysis on the level of awareness on importance of food security. Category sixth, is an analysis on the level of factors that lead to food insecurity and the last section of the results focuses on assessing the level of impact of food insecurity at household level and welfare.

4.1.1 Demographic Characteristics of the Household Heads

The major socioeconomic characteristics of households covered in the study area are presented. These characteristics relate to the relative frequency distribution of heads of household by gender, age, education level, marital status, main occupation and household sizes of the respondents.

4.1.2 Distribution of Household Heads by Gender

Gender is the most fundamental characteristics of a population which can reflect population dynamics and ratio of men and women in the area (URT, 2002). Gender of household head was used to capture the effect of gender on household food security.

Table 4.1: Percentage Distribution of Respondents by Gender (n=120)

		Village				
Gender	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average**
Male	Frequency	10	13	20	23	66
	Percent	33.3	43.3	66.7	76.7	55.0
Female	Frequency	20	17	10	7	54
	Percent	66.7	56.7	33.0	23.3	45.0
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

The pattern of gender distribution of household respondents was not similar across the four villages surveyed (Figure 4.1). However, in relative terms, the percentage of male was higher in Mahurunga village 76.7% while the percentage was lowest in Mtendachi village 33.3%. On the other hand, the percentage of women was found to be higher in Mtendachi village 66.7% and lowest in Mahurunga village accounted 23.3%.

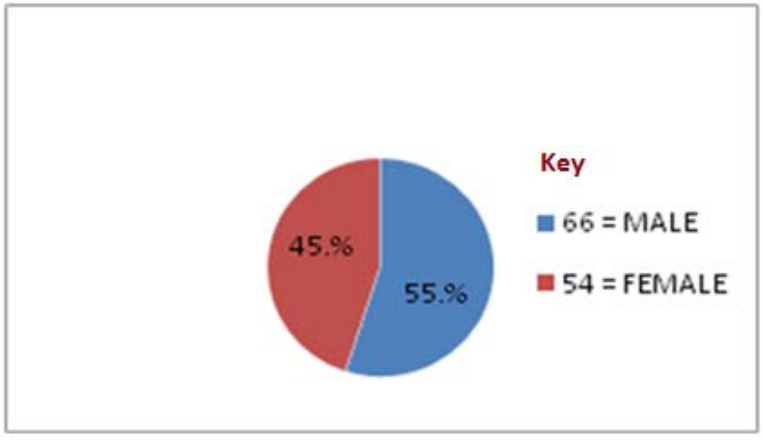

Figure 4.1: Percentage of Respondents by Gender

Source: Field data

But on average, about 55% of the households covered in the study area were male headed households while 45% were female headed household. It is therefore expected that, female headed households to be food insecure compared to male headed household because in Africa the scarce resources like finance are owned by males (Mmari *et al;* 2010).

4.1.3 Distribution of Household Respondents by Age

The predominance of active heads of the household in the study area has a direct bearing on increased availability of able-bodied labour for primary production in the study area. The percentage distribution is shown in Table 4.1.

Table 4.2: Percentage Distribution of Respondents by Age (n=120)

		Village				
Age	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average**
21-30	Frequency	1	4	1	2	8
	Percent	3.3	13.3	3.3	6.7	6.7
31-40	Frequency	4	6	10	5	25
	Percent	13.3	20.0	33.3	16.7	21.0
41-50	Frequency	4	6	13	8	31
	Percent	13.3	20.0	43.3	26.7	25.2
51-60	Frequency	5	10	6	7	28
	Percent	16.7	33.3	20.0	23.3	23.5
>61	Frequency	16	4	0	8	28
	Percent	53.3	13.3	0.0	26.7	23.5
Total	**Frequency**	**30**	**30**	**30**	**30**	**120**
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

Findings showed that, household heads with 21 to 30 years of age accounted 6.7%. Household respondents aged between 31 to 40 years accounted for 21%, household respondents accounted for 25.5% were in age between 41 to 50 years while the total household respondents of 51 to 60 years accounted 23.5%. Household heads aged above 61 yeas old found to constitute 23.5% of all the household respondents. For the sample as a whole, majority of the household respondents were in the age between 31 to 60 years which makes 69.8%.

These groups belonged to the group of economically productive group ranging from the age of 15 to 64 years old. The argument showed that, the working force in the study area is available and hence higher production was the expectation. The same observation on the importance of age on farm output as an important factor was reported by Rougoor *et al;* (1988). They examined extensively the significance of age and revealed that, the influence of age on farm productivity is very diverse.

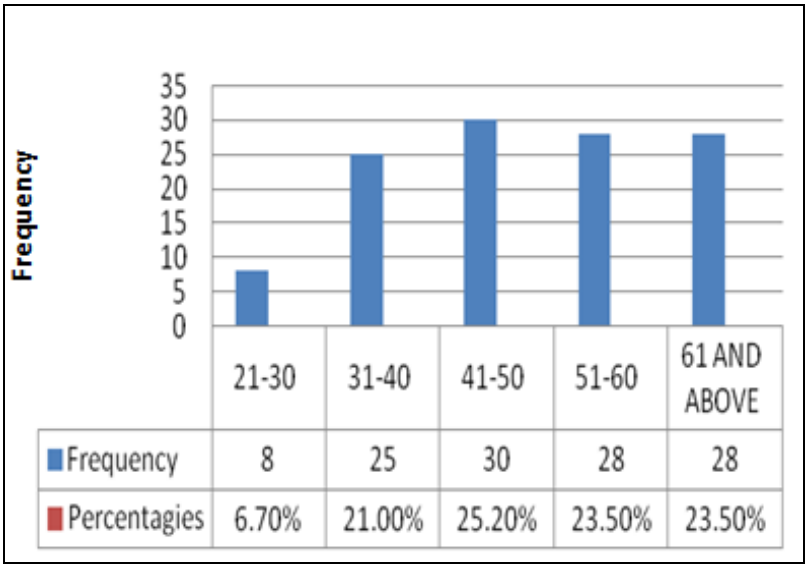

Figure 4.2: Percentage Distribution of Respondents by Age (n=120)

Source: Field Data

Some studies have found that, age has a positive effect on productivity (Kalirajan and Shand 1985, Stefanou and Saxena 1986). Farming experience has a significance influence on the decision making process of farmers with respect to risk aversion, adoption of improved agricultural technologies and other production related decisions. Age has been found to determine how active and productive head of the household would be. Age has also been found to affect the rate of household adoption of innovations, which in turn, affects household productivity and livelihood strategies (Dercon and Krishman, 1996).

4.1.4 Households Heads' Level of Education

The level of education is believed to influence the use of improved technology in agriculture and hence, farm productivity. Table 4.3 shows the distribution of the levels of education among the household respondents.

Table 4.3: Percentage Distribution of Respondents by Level of Education (n=120)

		Village				
Education level	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average**
Illiterate	Frequency	22	13	10	12	57
	Percent	73.3	43.3	33.3	40.0	47.5
Primary	Frequency	8	16	19	17	60
	Percent	26.7	53.3	63.3	56.7	50.0
Secondary	Frequency	0	0	1	1	2
	Percent	0.0	0.0	3.3	3.3	1.7
College	Frequency	0	1	0	0	1
	Percent	0.0	3.3	0.0	0.0	0.8
Total	**Frequency**	**30**	**30**	**30**	**30**	**120**

Source: Field Data

The results from the household respondents showed that, 47.5% of all the respondents in the two wards had not attended formal education at all (they cannot read and write). Half of the respondents (50%) attained primary school education and only 1.7% of all the respondents had secondary education while 0.8% of the respondents attended college in certificate level. However, the highest illiteracy level was found in Mtendachi Village with 73.3% of respondents being illiterate while Kitunguli was the lowest among the four villages with 33.3% of illiterate respondents, though the number is still high.

These results imply that, illiteracy was very high among the respondents in the study area in which it can be interpreted as a possible obstacle in applications of modern technology in various productive activities. The results concurred with many studies quoted from Amaza *et al;* (2006) which revealed that, the level of education (years of schooling) helps farmers to use production information efficiently, as a more educated person acquires more information and, to that extend, it is a better producer (Hayami 1969, Lockheed e*t al;* 1980, Philips 1994, Wang *et al;* 1996, Yang 1997).

4.1.5 Households' Heads Marital Status

The significance of marital status on agricultural production can be explained in terms of the supply of family labour. Table 4.4 shows percentage distribution of household respondents by marital status.

Table 4.4 shows that, majority of household respondents in the study area were married. On average, about 67.5% of all household respondents in the study area were married.

Table 4.4: Percentage Distribution of Respondents by Marital Status (n=120)

		Village				
Marital Status	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average (n=120)**
Single	Frequency	6	0	0	4	10
	Percent	20.0	0.0	0.0	13.3	8.3
Married	Frequency	10	23	22	26	81
	Percent	33.3	76.7	73.3	86.7	67.5
Divorced	Frequency	0	0	4	0	4
	Percent	0.0	0.0	13.3	0.0	3.3
Separated	Frequency	0	0	2	0	2
	Percent	0.0	0.0	6.7	0.0	1.7
Widowed	Frequency	14	7	2	0	23
	Percent	46.7	23.3	6.7	0.0	19.2
Total	**Frequency**	**30**	**30**	**30**	**30**	**120**
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

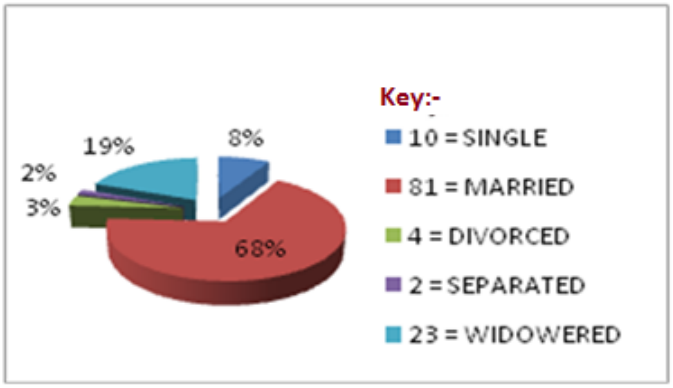

Figure 4.3: Percentage Distribution of Respondents by Marital Status (n=120)

Source: Field Data

The possible explanation of majority of sample household respondents in the study wards of Madimba and Mahurunga and Mtwara (rural) in general of getting married

early is that, various farming activities are done manually, and hence in order to assist each other in farming operations, getting married seems to be the solution rather than working in the farm singly. Widowed accounted for 19.2%, while 8.3% were single and the divorced were 3.3%. Lastly, the separated were 1.7%.

4.1.6 Distribution of Household Respondents by Occupation

The distribution of major types of occupation by household respondents is shown in Table 4.5.

Table 4.5: Percentage Distribution of Household Respondents by Occupation (n=120)

Occupation	Statistics	Village				Total average
		Mtendachi	Madimba	Kitunguli	Mahurunga	
Farmer	Frequency	27	29	29	30	115
	Percent	90.0	96.7	96.7	100.0	95.8
Fisher	Frequency	0	1	0	0	1
	Percent	0.0	3.3	0.0	0.0	0.8
Employed	Frequency	0	0	1	0	1
	Percent	0.0	0.0	3.3	0.0	0.8
Unemployed	Frequency	3	0	0	0	3
	Percent	10.0	0.0	0.0	0.0	2.5
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

The distribution of occupations was similar across the two wards in the four surveyed villages. Findings showed that, farming was the most important occupation of the household heads which accounted about 95.8%. This concurred with

(Kilahama, 2006 and Coad *et al*; 2008a) who observed that, majority of people in Africa their production and consumption pattern were mainly based on land resources because they lack knowledge to participate in other productive activities.

The second occupation of the respondents which accounted about 2.5% was unemployed household heads mainly from older people above 61 years old and sick people's sufferings from permanent diseases like HIV/AIDS and disabled. The third category of occupation of the respondents was household heads engaging in fishing activities which accounted for 0.8% of the total respondents in the study area. The last occupation from the household heads respondents was a small number of local government public employees accounted 0.8% who worked in the wards.

Table 4.6: Percentage Distribution of Household Respondents by Size (n=120)

		Village				
	Statistics	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average**
1 – 2	Frequency	4	3	10	2	19
	Percent	13.3	10.0	33.3	6.7	15.8
3 – 4	Frequency	8	12	12	10	42
	Percent	26.7	40.0	40.0	33.3	35
5 – 6	Frequency	8	8	4	11	31
	Percent	26.7	26.7	13.3	36.7	25.9
>7	Frequency	10	7	4	7	28
	Percent	33.3	23.3	13.3	23.3	23.3
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

4.1.7 Household Sizes

Household size has the significance in the food security. Table 4.6 shows percentage distribution of household respondents by household sizes in the study area.

The significance of household size in agriculture depends on the fact that, the availability of labour for farm production, total area of cultivated to different crops are determined by size of the household. Normally, the larger the family size, the more likely the farmer is to become successful as the household has more labour to work on the farm. However, this would only work if all family members are old enough to perform the farm work, otherwise if the household size consists of a majority of young children who cannot be used as family labour, it will not work. The findings in Table 7 indicated that, 35% of the household heads had 3 to 4 people in the family. The second group accounted 25.8% had 5 to 6 members in the family.

The third group accounted 23.3% had more than 7 members in the family. The average household size in the study area was 4.0 which is small than the average of Mtwara rural district which was 4.2. The average of Mtwara region is 4.7 while the average of rural Tanzania is 4.9 which is larger compared to the study area (URT, 2002).

The household size can influence food security at household level. Food insecurity increases as household size increases. Household with one or two members have the least percentage of food insecure household, as long as the members are not elderly or children. Households with 7 members are more vulnerable to food insecurity compared to those with fewer members (Chantesa *et al;* 2003).

4.2 Farming System and Land Use

The major farming systems characteristics of households covered in the study area are presented. These characteristics relate to household farm size, household land acquisition system, farming technologies, farms input and extension services to the household's respondents.

4.2.1 Household Farm Size

Farm size in this study refers to the land area that was actually used for crop production during the surveying year. The distributions of farm sizes in the study area are presented (Table 4.7).

Table 4.7: Average Farm Size for Household Respondents (n=120) (in acres)

		Village				
Farm Size	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average (n=120)**
0 – 1	Frequency	17	5	7	1	30
	Percent	56.7	16.6	23.3	3.3	25.0
2 – 4	Frequency	11	20	20	22	72
	Percent	36.7	66.7	66.7	73.4	60.8
5 – 7	Frequency	2	5	3	7	17
	Percent	6.6	16.7	10.0	23.3	14.2
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

The average land size ranged from 1 to 7 acres in all the study area. The findings revealed that, majority of the household heads respondents approximately 60.8% had farm sizes between 2 to 4 acres. The second category accounted 25% was noted to

own small fragments of farm sizes ranged between 5 to 7 acres of land. However, the findings revealed that, many farm households operated small and fragmented plots in the study area that was used for cultivation of different crops.

4.2.2 Household Land Acquisition System

According to the agricultural policy in Tanzania URT, (1983) all land in Tanzania is publicly owned and vested in the state. Figure 6 shows percentage of land acquired by household respondents in the study area.

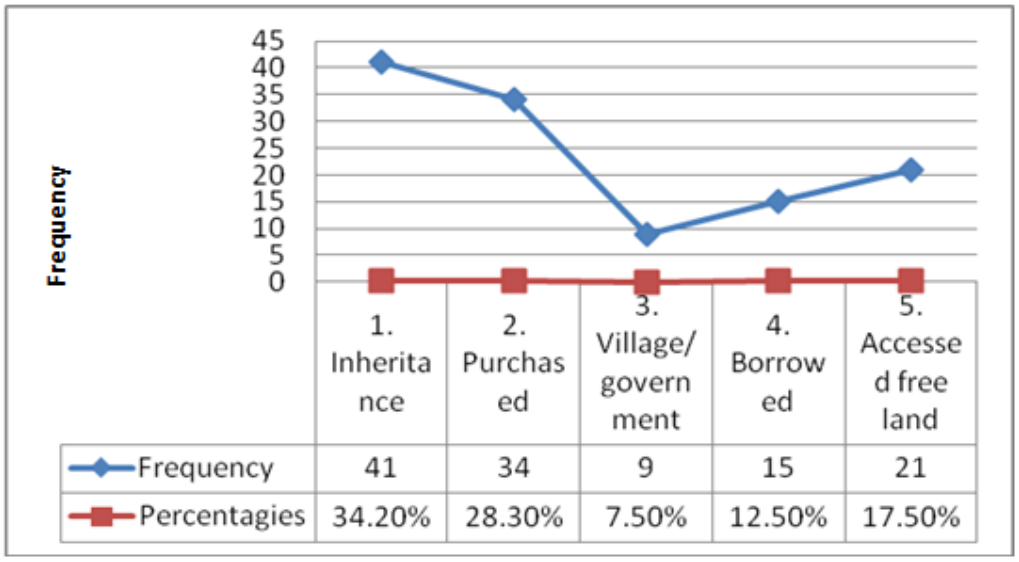

Figure 4.4: Land Acquisition by Household Respondents (n=120)

Source: Field Data

The findings in Figure 4.4, indicated that, majority of the respondents 34.2% in the surveyed four villages obtained their land by inheritance. The second method of land acquisition was found to be through purchase which accounted 28.3%. About 17.5% of the lands were accessed freely by individual through clearing of a new farm land that was not in use in all four surveyed villages, while 12.5 % of the total

respondents borrowed land and 7.5% accessed their land from the village government.

During Focus Group Discussions (FGD's) most of the agricultural lands in the surveyed area were noted to be held under customary system and most of the land was not properly surveyed and or individual households were given the right to use specified pieces of land indefinitely. It was found that, farmers cultivated as many hectors of land as they can on their customary owned land except in few restricted areas especially in mountain ranges, which act as rain catchment areas, for example, *Nyinyi* and *Mtamba* forest reserves in Mtendachi Village, *Chikukwe* in Kitunguli Village and *Kindokoto* in Mahurunga village.

4.2.3 Farming Experience of Household Heads in Years

Farming experience is an important factor that determines both the productivity and production level in farming. Table 4.8 shows farming experience of the household respondents.

Table 4.8: Percentage of Farming Experience by Household Respondents in Years (n=120)

	Village				
Years	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
1 - 10	20.9	13.3	42.6	52.1	32.2
11 - 20	26.9	34.7	28.2	31.6	30.4
21-30	23.3	25.5	18.2	12.0	19.7
31-40	28.9	26.5	11.0	4.3	17.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Field Data

The household of respondents showed variations in terms of farming experience. Majority of the household respondents approximately 32.2% had farming experience between 1 to 10 years. Households with farming experience between 11 to 20 years accounted 30.4% of the total respondents. About 19.7% of household heads had farming experience between 21 to 30 years. The last farming experience group between 31 to 40 years was found to account 17.7%. Generally, the findings showed that, household in the study area had considerable farming experience and the expectation was better farming methods due to many years of skills in food production.

4.2.4 Types of Food Crops Grown by Households

The major food crops grown by household of respondents are shown in Table 4.9.

Table 4.9: Percent Distribution of Important Food Crops Grown in the Study Area (n=120)

		Village				
Types of Crop	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average (n=120)**
Cassava and Millet	Frequency	9	30	2	2	43
	Percent	30.0	100.0	6.7	6.7	35.8
Maize and Paddy	Frequency	0	0	28	28	56
	Percent	0.0	0.0	93.3	93.3	46.7
Others	Frequency	21	0	0	0	21
	Percent	70.0	0.0	0.0	0.0	17.5
Total	**Frequency**	**30**	**30**	**30**	**30**	**120**
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Data Field

The findings in Table 4.9 showed that, the distributions of important food crops grown by household respondents was not similar among the two wards but were noted to be similar among each two surveyed villages from each ward in the area of study. The crops grown by households include: maize *(zeal mays);* cassava *(manihot esculenta),* paddy, *(orzya sativa),* sorghum *(sorghum bicolor),* common beans *(phaseolus vulgaris),* potato *(solanum tuberosum),* finger millet (*Eleusine coracna).*

The most widely grown crops in Mahurunga ward was maize and paddy 46.7%. Cassava and millet was the most important cultivated crop in Madimba ward accounted about 35.9%. Other crops included legumes plants 8.7% and vegetables 2.8%. Almost every household grows at least two crops on their land. This is indicative of the willingness of the households to take advantage of whatever opportunities are available to improve their condition.

Cashew nuts which is grown in the area of study, is number one cash crop in Mtwara district but it was noted in the surveyed four villages that, cashew nuts trees have been left unattended for considerable years and are of less productive and hence less depended by many household of respondents in the study area. It was found that, this trend has made food crops to be the only reliable source of income to the household and hence overselling of food crops can be explained as one of the reason of food insecurity in the study area.

4.2.5 Farming Technologies of the Households

Farming system in the surveyed villages and Mtwara rural district in general is characterized by both field and crop rotations. Table 4.10 shows percentage use of food production technologies in the study area.

Table 4.10: Percentage use of Types of Technologies in Study Area (n=120)

Types of Technology	Statistics	Village				
		Mtendachi	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
Hand Hoe	Frequency	30	30	27	2	43
	Percent	100	100	90	6.7	35.8
Oxen plough	Frequency	0	0	0	0	0
	Percent	0.0	0.0	0.0	0.0	0.0
Tractors	Frequency	0	0	3	8	11
	Percent	0.0	0.0	10.0	26.7	9.2
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

Generally, food crops production technology in the surveyed area was undeveloped. Most of the respondents depended much on muscle power and simple implements like *machete*, hand hoes, axes and *(pangas)* for various farm operations. The use of oxen plough does not exist at all along the surveyed villages and this is because the study area like other areas in Mtwara rural district and for that matter Mtwara region as a whole has few or not at all cattle keeping in many areas.

Therefore, use of family labour was observed to be predominant in the study area. As can be noted from Table 11, about 90.8% of the household of respondents used hand hoe and only 9.2% used tractor in farm cultivation. Similar findings have been reported by Kavishe *et al*; (1993) when explaining the reasons for food insecurity. They noted that, generally in Tanzania, farming technology is low, about 85% of cultivation is done by hand hoe and only 10% by oxen and 5% by tractor. Aman (2004) on his study about food security in Tanzania found similar trends and

reported that, continued use of poor and rudimentary technologies in farming mostly hand hoed is a major constraint to increasing production and productivity. Thus, lack of on-farm technological innovation in the study area, is a possible significant factor in decline in productivity per household and therefore causes food insecurity.

4.2.6 The Extent of Farms Input in Use

The finding of the farms inputs in use in the area of study was low as compared to average per hectare as shown in Table 4.11.

Table 4.11: Fertilizer Used by Household Respondents in Study Area in Kgs (n=120)

Fertilizer	Frequency	Total %
1 – 49	1	10.0
50 – 149	3	30.0
150 – 199	2	20.0
200 – 399	2	20.0
400 – 699	1	10.0
>700	1	10.0
Total	**10**	**100.0**

Source: Field Data

About 95.5% respondents indicated that, they did not apply agricultural inputs while 4.2% was mentioned to apply agricultural inputs in the cropping season of 2010/2011. Asked the reason why they did not apply agricultural inputs 66.7% respondents mentioned lack of funds to purchase fertilizers as the main reason, 28.1% lack of knowledge and 5.3% indicated fertilizers were not available. Further, it was found that, about 10% household of respondents used between 1-49 kg of fertilizer per season. Secondly, 30% respondents used between 50-149 kg of fertilizers and another 20% used between 150-199 kg of fertilizers. Another 20%

found to use between 200-399 kg while another 10% of respondents used between 400-499 kg while only 10% respondents indicated to apply more than 700 kg of fertilizers.

The percentage of household of respondents who used more than 200 kg decreases with increase in number of kilograms of fertilizer. Similar findings had been reported by FAO (1998) that, the application of fertilizers in Sub Saharan Africa is the lowest in the world, at 11 kg/ha compared with the world average of 62 kg/ha. Farm inputs (fertilizers, seeds, insecticides, herbicides etc) are fast becoming inaccessible to the peasant farmers due to rising prices. During FGD, discussants complained that, they failed to expand their areas of maize, paddy and cassava production because most of them did not have enough capital to buy farm inputs especially industrial fertilizers.

However, 73.6% respondents explained that, access to fertilizer use is constrained by market liberalization and trade policy that increase fertilizer prices as compared to the price of their crops. That, despite the present government policy of inputs subsidies, untimely supply and inadequate supply was the problems noted as major complaints by majority of the households.

For example, during FGD, discussants mentioned that, the availability of fertilizer, seeds and insecticides or pesticides did not reach to the farmers at all in the cropping season of 2010/2011 with the exceptional of cashew nuts insecticides that arrived in later season. Hence, they did not find any substantial reasons of cultivating more land while they have less capital to invest on farms. The analysis of farms input in

use in the study area has been found to be low in attaining high food production. This scenario can be one of factor that causes food insecurity in the study area.

4.2.7 Agricultural Extension Services to the Household Respondents

A question was asked to the respondents if they received agricultural services in the cropping season in 2010/2011. The findings showed that, extension services to the respondents were low in the cropping season of the year of study 2010/2011 in which only 13.3% of the respondents were visited by agricultural extension services and received advice on farming system *(shamba darasa).*

On the other hand, majority of the household respondents 86.7% did not receive any extension services for the whole season. Lack of extension services to the farmers was also reported by Aman, (2004) on agriculture development and food security in Tanzania that, constrained access to inputs and timely advice to stakeholders, particularly smallholder farmers to a large extent impedes progress in the intensification of agriculture.

There are many problems related to poor transfer of knowledge from research to application, including erratic access to extension agents and more recently transitional problems of decentralizing the management of extension services to the local government. From this analysis it is observed that, agricultural extension services to the respondents was limited and was one of the hindrances to agricultural development and can be associated with the issue of food insecurity in the study area.

4.3 Knowledge on Food Security

4.3.1 Overview

This section examines the perception on household of respondents on the concept of food security, knowledge on food security from local perspectives, sign of food insecurity from local perspective as well as general overall household food deficit coping strategies.

4.3.2 Perception on Household Respondents on the Concept of Food Security

To measure how respondents perceived the concept of food security; a five point hedonic scale was prepared in order to capture their knowledge on food security by asking respondents to mention what the food security concept mean. The aim of this exercise was to examine whether the four basic component of food security were clear to the household respondents (that is adequate, accessibility and stability of food supply and sustainability of food procurement).

Table 4.12 shows results of five point hedonic scale measuring knowledge on food security. From the Table, shows that, 59.9% of all household of respondents had excellent knowledge on food security, Kitunguli village having the highest number of knowledgeable respondents. The possible explanation of that situation might have been because of higher literacy rate among respondents. In Madimba village, respondents had the least number of excellent knowledge among the four villages and had a highest number of neutral and moderate knowledge respondents that was 30% and 26.4% respectively.

Extremely ignorant and moderate ignorant household of respondents did not exist in Kitunguli village but did exist in Mtendachi village 3.5% and 6.8%, in Madimba

village 6.4% and 0.5%, and in Mahurunga 3.4% and 3.6%. However, despite majority of the respondents having excellent knowledge on food security, that did not mean majority of households were food secure.

Table 4.12: Percentage of Knowledge on Food Security Concept by Respondents (n=120)

	Village				
Type of use	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
Extremely Ignorant(know nothing)	3.5	6.4	0.0	3.4	3.3
Moderate Ignorant(below average)	6.8	0.5	0.0	3.6	2.7
Neutral(no clear evidence of presence of lack of knowledge)	11.0	30.0	16.7	3.7	15.3
Moderate knowledge (above average	12.0	26.4	13.3	23.3	18.8
Excellent knowledge	66.7	36.7	70.0	66.0	59.9
Total	100.0	100.0	100.0	100.0	100.0

Source: Field Data

During Focus Group Discussion, participants complained that, there was a problem among the households on maintaining well balanced diet on their daily menu. It was observed that, lack of sustainable income was the reason behind this problem of food insecurity in the study area because money obtained from sale of agricultural produce was not enough to buy other necessary food like meat, fish, sugar, milk and other nutrition foods throughout the year.

4.3.3 Knowledge on Food Security from Local Perspectives

During Focus Group Discussion (FGD`s), which were conducted among the four villages, the discussants were asked to explain what they understand the term food security from local perspectives. Participants in Mahurunga ward agreed unanimously that, a family would be considered food secure if it had enough maize grain and rice for the entire season, while participants from Madimba ward mentioned food security to them mean as having enough cassava flour or dried pieces of cassava roots (*makopa*) to run for the whole year.

Participants from Mtendachi and Madimba village explained that, a family may have large quantities of other cereal crops like millet/sorghum or maize grains yet the majority of households will still consider the family to be food insecure simply because there is no cassava flour or *(makopa).* The same observation was made in Kitunguli and Mahurunga villages in Mahurunga ward where by participants considers being food insecure if there is no enough maize and rice even if there is plenty of cassava flour. Commenting on the concept of food security, one member from Kitunguli village attested that "if household rely very much on cassava flour for stiff porridge (*ugali*) preparation it implies that, the household is food insecure.

Most household of respondents in Mahurunga ward ate stiff porridge from cassava flour after the depletion of their maize and rice stocks, mainly between February and April. In case of Madimba ward, most of household ate food other than cassava flour in time when cassava stock is finished either due to rot of cassava while in the field or because of excessive selling of raw cassava. It was observed that, the concept of food security to most of household in the surveyed area implied physical and

economic access to foods that were adequate in term of quantity and culturally acceptability, other elements like nutritional, quality and safety were not considered as important elements.

4.3.4 Signs of Food Insecurity from Local Perspective

During Focus Group Discussion, participants were asked to mention various signs of food insecurity; the various indicators they mentioned included the limited number of families who bring food at traditional ceremonies and the amount of food brought by those who did. Traditionally, Makonde tribe during traditional ceremonies, (*unyago/jando*), bring uncooked food to the ceremonies places like maize or cassava flour and chicken. A sign of food insecurity can be noted in this period as the number of people who brings those presents. In times of food insecurity, few people offer less or no food due to shortage that occurs in that time.

Food insecurity creates disruption of normal peace in the household. In FGD's participants said that, in time of food insecurity misunderstanding and quarrels within members of the family increases especially between couples. Through their experience during FGD`s, participants discussed that, during harvesting times and four to six months later when food stored are still plenty in many households, misunderstanding and quarrels rate is lower among the couples as compared to period when families experience food shortage. In that time frequency of untimely divorce, short time separation and general unharmonious relationship is felt.

On the amount of food intake during period of food insecurity it was indicated that, quantities of food cooked per household do not correspond with the number of

household members. Household members eat less than what have been accustomed to. Family members eat small quantity of food in order to survive instead of living. From point of view, most of household members became weak and hence can easily be attacked by diseases at that particular period of the year because they try to work hard in farms with that small quantity of unbalanced diet they consume.

FGD participants also mentioned increase on number of beggars as one of the signs of food insecurity. Deficit household ask for food assistance from food surplus household. Usually these deficit households are not given food free of charge; instead, they ought to work on farms of surplus households especially clearing of field for the preparation of next farming season so as to be given food in return. In this period, casual labourers used to compete each other to get job for food and were another area of quarrel between the food insecurity household.

The same question was asked to respondents in the face to face interview, the results were as follows; 61.7% of respondents indicated to have reduced meals while 38.3% mentioned rise of food prices as an indicators of signs of food insecurity.

4.3.5 Household Food Deficit Coping Strategies

In order to know how household of respondents employed coping strategies during food insecurity, a question was asked to respondents during face to face interview on how they fed their families during the time of food shortage as shown in Table 4.13.

Findings from Table 4.13 indicated that, 27.7% used drought-resistant crops especially cassava as a coping strategy against food shortage. About 50.8% of all

respondents mentioned labour selling as means of addressing temporary food shortage. Other means used were selling crops for money 5.5%, selling of livestock 8.1%, and selling local alcohol 0.1% while 7.8% respondents indicated to engage in selling vegetables and or fish.

Table 4.13: Coping Strategies for Food Insecurity in the Households (n=120)

	Village				
Coping Strategy	**Madimba**	**Mtendachi**	**Kitunguli**	**Mahurunga**	**Total %**
Use Crops Sales Money	0.0	0.0	3.3	18.4	5.5
Selling Livestock	0.0	0.0	13.3	19.1	8.1
Selling Labour	54.0	56.7	54.2	38.3	50.8
Using Drought Resistant Crops	31.7	33.3	28.6	17.1	27.7
Selling Alcohol	0.0	0.5	0.0	0.0	0.1
Others	14.3	9.5	0.6	7.1	7.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Field Data

On coping strategies, participants in FGD's said that, household reduce the number of meals taken per day and some members of the families start relying on other relative for food assistance. From the analysis of copying strategies employed by food insecurity households, it was noted that, the use of family assets during time of food insecurity was negligible as compared to labour selling; this signifies a prevalence of poverty in the study area and therefore a reason for periodic food insecurity because of lack of income. In summary about the knowledge on the concept of food security it was found that, 59.9% of respondents had excellent

knowledge on the concept of food security. About 61.7% reduced meals as indicator of signs of food insecurity while about 50.8% employed labour selling as coping strategies as means of addressing temporary food shortage. However, despite majority of the respondents having excellent knowledge on food security, that did not mean majority of households were food secure.

4.4 Level of Food Production at Household

This section examines about the household food requirements, total harvest at the household level, household staple food and household food sources. The aim is to establish the actual food production level and its utilization by household of respondents**.**

4.4.1 Household Food Requirements

For the purpose of this study, food requirements means the amount of food required by households of respondents for their consumption from the period of harvest started from April 2010 until March or April 2011. Information was asked to the respondents to mention their food requirements from the time after harvest until next harvest according to the number of household members in the 2010/2011. The findings indicated that, food requirements per year by the respondents (n=120) in the study area was 87,962 kg of different types of food. Mtendachi was (20,100 kg) and Madimba (19,900 kg) while Kitunguli food requirement was (20,562 kg) and Mahurunga was (27,400 kg).

4.4.2 Aggregates Total Harvest in the Household

As it has indicated by respondents that, the total food requirement by respondents was 87,962 kg in the two wards of Madimba and Mahurunga in the 2010/2011

season, a question was asked to the respondents to mention the amount of food harvested in 2010/2011 season. Findings indicated that, food production in the cropping season in 2010/2011 was 117,520 kg. Madimba ward produced 56,820 kg (mainly cassava and little amount of sorghum/millet) and Mahurunga ward harvested 60,700 kg (maize and paddy).

Basing on the data of total production of 117,520 kg versus the actual food requirements by the households which were 87,962 kg, the household's respondents had an excess of 29,558 kg in the harvesting season of 2010/2011. In addition, it was noted that, cassava which grows well in poor soils, which requires little rainfall can be stored in the ground until needed.

These attribute cassava as a famine crop. However, though cassava is mainly produced for home consumption or marketed locally, during FGD, participants were asked if food production in the area of study is sufficient for the entire season. The answers revealed that, though the production of raw cassava can sustain as food for a long period, there was an increasing demand of fresh cassava root by urban traders for frying *(cassava chips)* for school pupils, casual labourers in small centers and also long distance trade of cassava flour.

This concurred with similar findings by EAGC (2010) that, due to high priority accorded in subsistence needs, yields are sold almost immediately after harvest and the farmers and or producers are subsequently unable to make adequate stock savings that could be useful in times of drought or for exchange.

4.4.3 Household Food Sources

A question was asked to the respondents to mention there sources of food. The findings are presented in Table 4.14 which shows percentage distribution of household sources of food.

Table 4.14: Percentage Distribution of Sources of Food by Respondents (n=120)

Types of source	Frequency	Per cent
From the household farm	119	92.2
Purchased in the market	1	0.8
Total	**120**	**100.0**

Source: Field Data

Findings showed that, there were similarities in all the villages surveyed in terms of household sources of food. About 99.2% of all the household respondents mentioned that, they obtained their household food from their own farm sources. Only 0.8% indicated that, they purchased food from the market as their food sources. Similar findings have been reported by EAGC (2010) ibd that, the major source of food supply in Tanzania is local production and on average Tanzania produces about 95% of its food requirements. In some years, the country's food self sufficiency measured by the self-sufficiency ratio (SSR) was over 100%.

4.4.4 Utilization of Harvested Food by Households

Information was collected on how food harvested was utilized by household of respondents in the study area. Respondents were asked to explain how many bags of grains were stored for future use. Table 4.15 shows utilization of harvested food

crops in Madimba and Mahurunga wards. Findings from respondents showed that, about 56.8% of food harvested in the ward was sold immediately to take care of immediate cash needs while about 25.2% was reserved for future use including consumption and other purposes while 18% was used in the transitional period before households started consuming stored food. On other hand, the amount of food sold immediately after harvest varied between villages ranging from 11,202 kg to 21,597 kg as presented in Table 4.15.

Table 4.15: Utilization of Food by Respondents in the Study Area in Kg (n=120)

Ward	Village	Type of use		Percentage
	Mtendanchi	Harvested	26580	
Madimba		Immediate consumption	6113	23
		Immediate sales	13822	52
		Stored	6645	25
		Total	26580	100
	Madimba	Harvested	30240	
		Immediate consumption	6653	22
		Immediate sales	17237	57
		Stored	6350	21
		Total	30240	100
	Kitunguli	Harvested	28940	
Mahurunga		Immediate consumption	6077	21
		Immediate sales	14181	49
		Stored	8682	30
		Total	28940	100
	Mahurunga	Harvested	31760	
		Immediate consumption	6987	22
		Immediate sales	21597	68
		Stored	4764	15
		Total	**31760**	**100**

Source: Field Data

However, there was dissimilarity of food retention among the four villagers surveyed. Mtendachi village had a relatively surplus of food stored after harvest as compared to the other villages. For example, while respondents in Mtendachi stored on average 6,645 kg, respondents from three villages' stored food between 4,764 kg to 8,682 kg (Mahurunga 4,764 kg, Madimba 6,350 kg and Kitunguli 8,682 kg). On consumption pattern findings showed that, in Mtendachi village household of respondents consumed 23% of all harvested food immediately after harvesting, Madimba 22%, Mahurunga 22% and Kitunguli 21%.

Utilization of food harvested differed much with reference to amount of food stored (maize, rice and cassava). Household respondents in Mahurunga indicated to have sold 68% and Madimba sold 57% of all harvested crops right away after harvest than respondents in Mtendachi who sold 52% while Kitunguli respondents sold 49%.

The analysis on the level of food production in the households and its utilization of harvested food by respondents indicated three issues. First, the amount of food requirements was sufficient to the household in the whole season; second, the amount of food harvested could be used in consumption and sold for cash in the market. Third, selling of harvested food (56.8%) was as important as home consumption (43.2%). Therefore, the high quantity of food sold immediately after harvest supported the tentative explanation that, overselling could be explained as one of the key problems leading to food insecurity in the study area.

In summary on the level of food production at household level, 32.2% households had farming experience between 1 to 10 years while 30.4% had farming experience

between 11 to 20 years and 19.7% had farming experience between 21 to 30 years. However, despite considerable farming experience and many years of skills in food production, the level of food production of all food crops in the study area was very low. Further, despite excess of food production of 29,558 kg against 87,962 kg of food requirements in 2010/2011, about 56.8% of all food harvested was sold immediately after harvest.

In conclusion, poor farming technology, excessive selling of harvested food crops and high prices of agricultural inputs in the study area contributed significantly to low food production and hence food insecurity.

4.5 Level of Awareness on Importance of Food Security

4.5.1 Overview

Level of awareness on the importance of food security is vital to the welfare of the households. In this section, the discussion aimed at attempting to establish the level of awareness and importance of food security to the household heads as well as household members in general.

4.5.2 Advice on Food Storage Techniques

A question was asked on to the respondents if they received advice on proper grain storage practice in 2010/2011. The findings showed that, out of the 120 respondents whom were administered in questionnaire, 88.8% complained that, they never received any expert advice on proper grain storage methods and practices while only 11.2% received expert advice.

Proper advice on food storage to the households may reduce the loss of grains to pests and diseases without requiring financial outlay. Relevant teaching on better method on food storage techniques especially about the main enemies of stored grain such as mould, insects, rats and mice and environmental factors affecting their multiplication is required to ensure crops are protected. Lack of advice on food storage expose crops to pests destruction thus contributing to food insecurity.

4.5.3 Eating Pattern by Households Members

A question was asked to the respondents on eating pattern in order to establish their level of awareness on food security. Results are presented in Table 4.16.

Table 4.16: Number of Meals Taken by Respondents per Day (n=120)

Number of Meals	Statistics	Village				Total average
		Mtendachi	Madimba	Kitunguli	Mahurunga	
One	Frequency	6	0	0	1	7
	Percent	20.0	0.0	0.0	3.3	5.8
Two	Frequency	19	11	7	11	48
	Percent	63.3	36.7	23.3	36.7	40.0
Three	Frequency	5	19	23	18	65
	Percent	16.7	63.3	76.7	60.0	54.2
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source Field Data

Findings indicates that, 54.2% of the respondents had eaten three meals in the whole cropping season of 2010/2011 while 40% had eaten two meals in the whole season per day while 5.8% indicated to have eaten only a single meal a day.

In total, the findings showed that, 45.8% of the respondents faced different levels of food deficits (those 5.8% and 40% respondents who afforded one meal and two meals) were categorized as food insecure. Eating one or two meals per day meant that, households concerned happened to eat the said meals in more than one incidence for the cropping season of 2010/2011 and does not mean that the household practiced the eating pattern for the entire season consecutively.

However, in Mtendachi village (20%) respondents said that they were able to provide one meal on bad days where as Madimba and Kitunguli villages household respondents had never experienced eating one meal in the entire season. This again shows that, food security varies a lot within the study area, with elderly and widowed being most vulnerable. Eating pattern normally is determined by availability of food in the households. However, any fluctuation of food availability in the households; necessitates them to change eating pattern.

This may be caused by seasonal food insecurity caused by overselling of food stuff for cash and other needs such health, education and clothing. In addition, post harvest management knowledge contributes to food insecurity. As it can be seen in Table 4.16, these findings concurred with what Tuhoye (2010) ibd; found on his report on Tanzania Food Balance Sheet that, this scenario perpetuates the cycle of food insecurity, as it causes households to change their eating patterns and habits.

4.5.4 Food Consumption and Importance on Nutritious Food

Respondents were asked if they are aware on the importance of consuming nutritious food. The findings showed that, the majority of the households 61.7% were aware on

the importance of consuming nutrition food. The rest of the respondents 38.3% were not aware on the importance of nutritious food. However, eating or not eating or being aware about the importance of nutritious food is not the issue to most of the respondents. The main issue here is that, people are aware on the importance of consuming nutritious food, but economic power to access nutritious food especially during periods of food insecurity was noted to be the problem.

4.5.5 Food Identification Level

A question was asked on the respondents so as to establish food identification level. For example, out of 120 respondents involved in the study 47.5% were found to be illiterate. This implies that, even the level of identifying foods that provides recommended nutrients or the art to choose between different foods to identify the most nutritious ones could be a hard task for an illiterate household head. Asked about the knowledge and awareness of foods which provide nutrients, 62.5% of the respondents indicated that, they knew the foods that provided nutrients recommended while 37.5% indicated that, they did not know any types of foods that provides recommended nutrients. Asked if household heads can choose between different foods to identify the most nutritious ones 55.8% of all respondents indicated that, they know, and 44.2% indicated that, they don't know how to choose between different foods to identify the most nutritious ones. The percentage of respondents who indicated that, they don't know any type of food which provides recommended nutrients (44.2%) was almost the same with the percentage of illiterates 47.5%. This implies that, food identification level among the respondents is poor because of low level of education in the study area.

4.5.6 Eating Habit and its Effect on Health of People

Eating habit of different foods has both direct and indirect implication on human health. Eating some food as a habit has been found to cause numerous diseases because of their poor nutrients content. The neglect to eat some foods because of habits or taboos likewise causes health problems.

Respondents were asked to explain the health implication of eating or failing to eat particular foods. Findings showed that, 61% agreed that, they know the health implication of eating or failing to eat particular foods. About 39% showed that, they are not aware of the implication of eating or failing to eat particular food on their health. However, there was uniformity of answers in the three village surveyed except Mtendachi village.

The level of awareness among villagers was 90% in Mahurunga, Kitunguli 70% and Madimba 70% while in Mtendachi awareness was 0%. The possible explanation of Mtendachi villagers to be totally ignorant is related to the level of education. It was indicated that, the level of education among Mtendachi villagers is 73.3% while the remaining 26.7% had reached standard 3 and 4 hence semi-illiterate. This implies that, low level of education may affect awareness of eating habits of household respondents and have direct implication on their health.

On the level of awareness on importance of food security it was found that, 88.8% had no advice on proper grain storage methods, 54.2% and 40% households had eaten three and two meals respectively while 5.8% had eaten single meal a day. On

food consumption and importance on nutritious food 61.7% were aware on the importance of nutrition food while 38.3% were not aware. On the food identification level 62.5% knew the foods that provided nutrients while 37.5%were not aware.

In summary on the level of awareness on importance of food security it was found that, 88.8% had no advice on proper grain storage methods, 54.2% and 40% households had eaten three and two meals respectively while 5.8% had eaten single meal a day. On food consumption and importance on nutritious food 61.7% were aware on the importance of nutrition food while 38.3% were not aware. On the food identification level 62.5% knew the foods that provided nutrients while 37.5%were not aware. On the identification of nutritious food 55.8% were aware and 44.2% were not aware while on the eating habit and its effect on health 61% knew and 39% were not aware on the health implication of eating or failing to eat particular food. In conclusion, low level of education among the household affect awareness of eating habits and had direct implication on their health.

4.6 Various Factors that Lead to Food Insecurity

This section examines the various factors that lead to food insecurity among the household of respondents in the study area.

4.6.1 Types of Storage Structures and Methods in Use in the Study Area

Storage facilities for crops harvested by the households are important because if there no storage facilities crops may be damaged or lost. Apart from pressure to sell crops soon after harvest by the households due to cash needs, lack of storing

facilities can be a possible reason why household have to sell off their food crops immediately after harvest when prices are always low. A question was asked to respondents to mention types and structures they use in food storage as shown in Table 4.17.

Table 4.17: Types of Storage Used by Respondents in the Study Area (n=120)

		Village				
Storage Type	**Statistics**	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
Kitchen Ceiling storage	Frequency	30	30	16	14	90
	Percent	100.0	100.0	53.3	46.7	75.0
Polythene bags	Frequency	0	0	14	15	29
	Percent	0.0	0.0	46.7	50.0	24.2
Gourds or pots	Frequency	0	0	0	1	1
	Percent	0.0	0.0	0.0	3.3	0.8
Total	Frequency	30	30	30	30	120
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

The findings in Table 4.17 show that, kitchen ceiling is the main storage system used as 75% of all 120 household respondents indicated to use it. The second type used was polythene bags which accounted 24.2%. The last type of storage facility in the study area was gourds and pots accounted 0.8%. Asked why they prefer these storage types, 75% of respondents who indicated to use kitchen ceiling storage said that, it is easy to store by hanging and the stored food normally maize and cassava root *(makopa)* are easily prevented from pests by kitchen smoke while 24.2% of respondents who used polythene bags as type of storage mentioned that, polythene bags are very economical in space utilization, could be easily stored in the living

house and can easily be protected against theft and moreover are readily available in the market. The remained respondents 0.8% who used gourds or pots storage indicated to use that type of storage because of lack of money to purchase polythene bags.

As it was shown in this report that, out of 120 respondents, 88.8% indicated that, they had never received any expert advice on proper grain methods and practices. Therefore, storage structures in use in the study area have been found to be ineffective in controlling insects and pests in food storage and thus contribute to food insecurity in the study area.

4.6.2 Food Treatments Before the Storage

Food treatment is very important so as to preserve food before the storage. A question was asked to household of respondents to explain how they treated their food before storage as has been shown in Table 4.18.

Table 4.18: Food Treatment before Storage by Household Respondents (n= 120)

Types of use	**Frequency**	**Percentage**
Treated	24	20.9
Did not treat	91	79.1
Total	**115**	**100.0**

Source: Field Data

The findings indicated that, majority of the respondents 79.1% did not treat their food meant for storing. Another 20.9% said that, they applied chemical insecticides in food treatment before storage while 4.1% did not answer the question on the

application of food treatment before storage. These findings show that, the majority of respondents did not treat food before storage. Neglect to protect food or crops from pests or rodents before storage causes food crops loss due to pest destruction. Pests are a great problem in regions where the relative humidity is high which resembles a typical situation in the area of study. The findings concurred with Paster (1993), who estimated that, worldwide there are 20 insect species out of 100 known to cause damage to food and are considered to be major pests, therefore are responsible for destruction of food and hence causing food insecurity.

4.6.3 Prevention of Insect Pests during Storage

Insect pests and mites, fungi and rodents are the principal agents of destruction of food during storage. Much food may be lost or spoilt during storage by mould or by insects, rats and mice due to poor method of storage or lack of proper treatment during storage. Table 4.19 shows percentage of food destructed because of lack of treatment during storage in the study area.

Table 4.19: Destructed Food not Treated During Storage in Kg (n=120)

Ward	Village	Food stored	Destructed	Total %
Madimba	Mtendachi	9825	3831	39
	Madimba	6350	1778	28
Mahurunga	Kitunguli	8682	2865	33
	Mahurunga	4764	1476	31
Total		**29621**	**9950**	**33.5**

Source: Field Data

In order to establish how respondents treated their food during storage, a question was asked to the respondents to explain if they used pest and or insecticides to treat their crops during storage. Findings in Table 4.19 show that, 64% of all respondents did not apply any pesticides treatment that was essential in controlling pests during storage while 19% respondents used natural deterrent and 17% indicated to have used chemical pesticides.

However, it was found that, respondents who indicated to use natural deterrent, 17.6% of them mixed with ash, 7.4% mixed stored food with herbs while 75% were found to put stored food under kitchen smoke. This concurred with similar findings from National Academic of Science (1978) that, in developing countries, traditional pest control systems not involving chemical insecticides, opts use of local herbs, mixing ash with grain and smoking has been encouraged on the ground that, insecticides uses present severe health and environmental hazards.

A question was asked to household respondents whom did not apply treatment during storage. The findings showed that, 40.5% of respondents did not use chemical pesticides because had no money to purchase pesticides while 23.5% said that, they had little food left to store hence they did not find the reason of buying the chemical pesticides and 36% respondents indicated they did not applied apply treatment because of lack of knowledge.

As it was noted only 17% household of respondents used chemical pesticides on their grain storage. When asked to mention the types and names of the chemical pesticides used, 3.4% of respondents though used chemical pesticides failed to

mention the types and names of chemical pesticides they used in their storing the food crops. Therefore, under such circumstances chemical pesticides had the possibility of leading to very serious health problems. When respondents asked to explain the effectiveness of treatments, household of respondents that used chemical pesticides and natural deterrent 17.8% indicated that, the treatment was very effective while 62.2% indicated treatment was slightly effective and also 20% indicated the treatment was not effective at all. Again, failure to use chemical pesticides during storage by majority of respondents was a problem that led to exposing food crops to destruction of pests or rodents thus creating food insecurity.

On the amount of food losses because of lack or ineffectiveness of treatment during storage, a question was asked to the respondents to explain the actual losses. As the findings in Table 20 showed that, out of 29,621 kg of food stored by respondents, 9,950 kg of food which was 33.5% were destructed by pest. The leading villages in food destruction were Mtendachi 39%, Kitunguli 33%, Mahurunga 31% and Madimba 28%.

However, during FGD's discussants were asked what other techniques do they use in prevention of pests during storage, participants acknowledged the importance of chemical pesticide treatment during storage which proved to be more effective in pest control as compared to traditional treatment.

4.6.4 Prevalence of Diseases and Pests Before and During Storage

A question was asked to respondents on any new pests which rendered the storage techniques inefficient for the prevention of food losses. Findings showed that, 87%

of respondents indicated the existence of pests that render storage of food ineffective, 9.4% indicated there were no serious new pests which rendered the storage techniques inefficient for the prevention of food losses in their storage while 3.6% respondents did not answer the question. However, majority of household of respondents indicated that, there are number of prominent pest that have been causing severe food losses each year in the study area apart from rodents which was mentioned as a common cause in every household of respondents. The most mentioned pests by respondents included *vyabanda* and *vanamule* in local names, scientific name known as (*tryborium spp, stophyla spp)* respectively. On the other hand, during storage maize, rice and millet have been mentioned by household of respondents to be attacked by Large Grain Borer (LGB). However, during discussion with key informants from district agricultural officials, they explained that, cassava crop is being affected by bacterial diseases such as bacterial stem rot (*Erwinia carotovora subsp. Carotovora*), fungal diseases such as black root and stem rot *(Scytalidium sp. Hendersonula toruloidea (syanamorph*) and Viral and Phytoplasma popularly known as *African cassava mosaic.* Therefore, these diseases and pests apart from causing severe yield losses which at the end cause food insecurity among the households; it is also one of the sources of household poverty.

4.6.5 Post Harvest Operation and Losses

Information was sought to establish post harvest operation losses experienced by household of respondents during harvesting time. A question was asked to respondents on post harvest operation regarding food losses. Table 4.20 presents the findings.

Table 4.20: Post Harvest Losses of Food Associated with Different Operations (n=120)

Post Harvest Operations	Statistics	Village				Total average (n=120)
		Mtendachi	Madimba	Kitunguli	Mahurunga	
Before harvest	Frequency	0	0	1	4	
	Percent	0.0	0.0	3.6	13.3	4.2
During harvest	Frequency	0	0	0	14	
	Percent	0.0	0.0	0.0	46.7	11.7
During shelling	Frequency	0	0	0	1	
	Percent	0.0	0.0	0.0	3.3	0.8
During storage	Frequency	27	30	27	11	
	Percent	100.0	100.0	96.4	36.7	83.3
Total	Frequency	27	30	28	30	115
	Percent	100.0	100.0	100.0	100.0	100.0

Source: Field Data

The finding shows that, 79.2% of all respondents indicated they had been experiencing severe loss during storage caused by pests. Losses during harvest ranked second which accounted for 11.7% where by transportation of harvested food by bags especially maize and paddy was found to be possible cause. About 4.2% respondents indicated that, it was caused by wood feed on crops before harvest such as livestock, baboon and monkeys and also birds were mentioned to be the cause. Lastly, 0.8% of respondents mentioned shelling process cause loss due to breakage; spillage and failure to collect all the shelled grains from the shelling ground while 4.1% did not answer the question.

For example, cassava presents particular problems of loss estimation because it can be stored either on root sliced pieces *(makopa)* or in form of flour because it's highly

perishable. This has similarity with maize crop which can also be stored on cobs or shelled. The same findings on post harvest losses of food in African countries was reported by FAO, (1983), in which it estimated that, African farmers lose 15% to 25% of their crop in the field and another 15% to 20% after harvest because of pest. It is therefore concluded that, food losses in the post harvest operation which is associated with lack of skills to protect food crops in the field and after harvest through improper processing and storage, is one of the reason that contributes to food insecurity in the area of study.

4.6.6 Magnitude of Food Losses during Storage

In order to estimate precisely the magnitude of losses experienced by respondents during storage, actual grain sampling and analyzing is the appropriate method to arrive at correct estimate. But due to time constraints, this was not possible instead; household respondents were asked to quantify the magnitude of grain losses they experience in their storage structures. Respondents were asked to mention how much produce they lost during storage. Table 4.21 shows the quantity of losses experienced by respondents during storage.

Findings from Table 4.21, indicated that, 61.5% household of respondents lost between 1-200 kg during the whole period of food storage; Mtendachi village had the highest percentage of respondents who lost more quantity (63.5%). About 27.2% respondents lost between 201-400 kg, Kitunguli village having the highest percentage of respondents falling in this group (39.8%). About 5.2% of respondents lost between 401-600 kg while 6.1% respondents lost more than 601 kg.

Table 4.21: Amount of Losses during Storage by Respondents in Kg (n=120)

	Village				
Losses in Kg	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
1 – 200	63.5	72.4	53.3	56.6	61.5
201- 400	20.0	20.0	39.8	28.9	27.2
401 – 600	10.0	3.4	3.5	4.3	5.2
>600	6.5	4.2	3.4	10.2	6.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Field Data

The possible explanations for the magnitude of losses are due to low rate application of chemical pesticides by household of respondents as it has been shown in this report that, only 20.9% of the total respondents applied chemical pesticides before storage. Second, only 17% of the total household respondents applied chemical pesticides during storage. Third, some of the household respondents did not treat their grains neither with natural materials nor with chemical pesticides.

Generally, losses on storage have been noted to increase with time lapse from the date of storage. The number of pests in infected grains has been found to increase after six months of storage. When asked about the time of which storage losses are more serious, 86.6% respondents reported the time between December and February, approximately six to eight months after commencement of storage. Therefore, food losses during storage suggest that, is one of the factors that cause food insecurity in the study area.

Table 4.22: Months of Starting Consuming and Finishing Stored Food (n=120)

	No. of Respondents Start Consuming Stored Food	
Month and Year	**Frequency**	**(%)**
Sept 2010	49	(39.3)
Oct 2010	16	(13.3)
Nov 2010	20	(16.6)
Dec 2010	37	(30.8)
Total	120	(100)

	No. of Respondents Finishing Stored Food

Source: Field Data

4.6.7 Duration of Storage

Duration of storage gives an impression of production seasonality and household's consumption and selling strategies of stored food. Duration of storage is shown in Table 4.22.

	Frequency (%)
Jan 2011	15 (12.5)
Feb 2011	18 (15.0)
Mar 2011	24 (20.0)
Apr 2011	63 (52.5)
Total	120 (100)

Table 4.22 shows the consumption pattern. Findings showed that, the consumption on September was 39.3%, on October 13.3%, November 16.6% and 30.8% on December. On examining the relationship between quantities of food stored and time of food depletion it showed to fall under short period of food storage (1-4 months, Table 23). The table shows the time when most households depleted their stored food. About 47.5% of sample household respondents run out of stored food between January and March each year and 52.5% run out of stored food in April. The findings on duration of storage for respondents showed to be 8 months, which is from September 2010 to April 2011. Most household respondents start consuming their stored food (cassava, maize and rice) between September and December.

On the other hand, duration of storage may be a sign of lack of alternative income sources or consumption substitutes. In both cases storage for longer period of time may be viewed as an insurance against both income and food shortages. Due to seasonality of production, food storage may remain in store for moderate long periods. Under good storage management, maize, rice and millet could be stored for as long as one year. However, poor storage as has been noted as one of the reasons of food insecurity among the respondents in the study area.

4.6.8 General Causes of Food Insecurity

During focus group discussion (FGD), the participants were asked to mention various reasons that cause food insecurity among households in the study area. Discussants complained that, they failed to increase more farms because most of them perform various operations manually, starting from land preparation, ploughing, planting, harvesting and storage. No machines are employed to perform these operations. Under such situations, household respondents have limited capacity to expand their farms and hence continue to produce only for subsistence.

FGD's participants were noted to be aware on the importance of application of farm inputs utilization, especially chemical fertilizer and chemical pesticides in order to increase food crops production as well as preservation of stored food for a long time. On the other hand, participants showed concerned about sky rocketing of the price of these farm inputs as a hindrance to their production. On average one hector needs 2 bags of fertilizer of 50 kg for planting and also 2 bags of 50 kg for crop growing per season. Likewise 100 kg of grain needs 1 litre of pest control during food storage applied once. At the time of the study, farm inputs needed by respondents in the study area were sold as follows (depending the distance from the source of supply); Fertilizers: Urea 50 kg Tshs 100.000/=, Calcium of Ammonia Nitrate (CAN) 50 kg Tshs 120,000/=, Insecticides/pesticides: Karate 1 liter Tshs 26,000/=, Fastac 1 liter Tshs 25,000/=.

FGD's noted that, dependence on food crops as a sole substitute of cash crop (after a reasonable number of households left cashew nuts farms unattended due to high cost of maintenance- pesticides and low and unstable market price), had an adversely

effect on most of households respondents. Formerly, cashew nuts were used to supplement food crops as a source of cash. Due to consistent decline of the selling price of this crop in relation to the higher cost of production, most households had abandoned to maintain cashew nuts farms thus leading to most farmers relying on cultivating cassava, maize, paddy and millet/sorghum crops which are less expensive in cost of production and are marketable easily.

Farming practices in the study area especially shifting cultivation, which involves forest clearing, was mentioned to be the cause of occurrence of considerable rodents in farms and house in the study area. During FGD, one discussant associated the appearance of massive rodents and the practice of shifting cultivation. He stated that, "as a result of forest clearance rodents have changed their eating habits, instead of eating wild fruits; rodents have turned into eating and depending on food crops cultivated by farmers at the fields (cassava) and in storage structures at the house due to unavailability of wild fruits".

Other discussants in FGD's indicated that, improper fishing along Ruvuma river (Mahurunga and Kitunguli villages), Mtendachi and Madimba villages along the Indian Ocean have spoiled marines plants that are necessary in fish reproduction which is source of protein due to use of explosives (dynamites) in fishing.

Lack or failure to control effectively insects and pests especially in stored food was also mentioned by FGD's participants to be the cause of food insecurity. Pests have not been effectively controlled, hence causing massive losses on stored food. Failure

to use chemical treatment was cited as an example of the causes of food inadequacy among the households in the study area.

Other FGD's participants said failure to use proper farming techniques including proper spacing, plant density, and fertilizing and weed control to be among the causes of food insecurity which have resulted into low productivity. Traditional and religious ceremonies were also mentioned to be among the causes of food insecurity among households. Most households who engage themselves on these ceremonies always found themselves having little food to store because of excessive and improper utilization of harvested food on these ceremonies.

Regarding the factors that lead to food insecurity in the households it was found that, 75% of storage structures in use were kitchen ceiling, 24.2% polythene bags and 0.8% gourds and pots. It was also revealed that, 79.1% households did not treat food before storage while 64% did not apply any pesticides treatment in controlling pests during storage. On the amount of food losses, 79.2% households had experienced loss during storage and 33.5% of all total food stored was destroyed by pest during storage. Further, about 61.5% lost between 1-200 kg, 27.2% lost between 201-400 kg, 5.2% lost between 401-600 kg while 6.1% lost more than 6 01 kg of food during storage.

It was concluded that, poor storage methods and structure and poor treatment of food crops during storage resulted to loss of food stored due to pest and could be on of factors leading to food insecurity in the study area.

4.7 Level of Impact of Food Insecurity at Household Level

On the level of impact of food insecurity at household level it was found that, 46.8% households were found to be food insecure, 67.5% cut size of meals to children, 35% children skipped meals while 43.3% children happened not to eat for a whole day while 65.8% of adults cut or skipped meals, 59.7% did not eat proper meals and 85% bought food as the implication of food insecurity in the households.

4.7.1 Overview

This section examines the level of impact of food insecurity at the household level and its implication on the household member's welfare.

4.7.2 Food Adequacy or Inadequacy Status

A question was asked to the respondents to explain how long the food produced in the cropping season lasted in the year 2010/2011 before next harvest. The aim was to establish food adequacy or inadequacy status from the respondents.

Findings show that, 53.2% of household of respondents was classified as food secure while 46.8% were classified as food insecure. However, it was found that, there was a variation of food insecurity among the respondents in terms of level of food insecurity. The number of household respondents found to be food secure (53.2%) indicated that, they did not experience food insecurity in their household's members for the whole season until next harvest in May/June 2011.

Those household respondents indicated to be food insecure (46.8%) had temporary food insecurity in such a way that, they purchased food and reduced food portion sizes to their family members. Asked the reasons of food insecurity 23.5% of household respondents indicated poor farms implement, 40.8% excessive selling,

5.8% sickness of their family's member while 30% indicated poor storage as the source of food insecurity in their families.

However, the status of food insecurity to all the surveyed villages was found to be on transitory and did not reach at a serious level of chronic food insecurity. Therefore, apart from adequate harvest in the study area, excessive selling and poor storage techniques can be explained as the source of food insecurity in the households.

4.7.3 Implications of Food Insecurity on Family Members

The information was sought on the implication of food insecurity to family members by asking household heads if they ever happen to cut the size of any of the family's meals because there wasn't enough food in the 2010/2011. Results are presented in Table 4.23.

Table 4.23: Eating Pattern for Food Insecurity Household Respondents (n=120)

	Village				
Eating Pattern	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
Cutting size of children meals	80	90	76.7	23.3	67.5
Children skipped meals	20	100	20	0	35.0
Children not eaten whole day	46.7	70	53.3	3.3	43.3
Adults cut/skipping meals	86.7	100	56.7	20	65.8
Adults not eating a whole day	80	90	65.5	3.3	59.7

Source: Field Data

Findings showed that, 67.5% of household of respondents indicated to cut size of meals to children because there was not enough food, 35% indicated that, children skipped meals in different occasions in 2010/2011 while 43.3% of the total household respondents indicated children happened not to eat for a whole day in different days when the situation of getting food or money to purchase food was difficult. About 65.8% of respondents indicated that, they happened to cut or skipped meals while 59.7% respondents happen not to eat proper meals for a whole day in different days in the cropping season of 2010/2011 in their households due to food insecurity.

From these findings, it shows that, food insecurity in the study area is a problem to family members and in particular to children. Wachs (1995), found similar impacts of food insecurity to children and reported that, inadequate nutrition has been associated with decreased ability to concentrate and poor school performance. Also, (Brown *et al;* 1996, Kleiman *et al;* 1998) on malnutrition and intellectual development in children showed that, prolonged inadequate nutrition that may derive from food insecurity can have serious health implications to children.

Adult's members cutting or skipping meals had an effect in terms of economic production. For example, during Focus Group Discussions, one participant from Mtendachi village mentioned that, "some days he feels so weak to the extent that he had no strength left to go to the farm". It is therefore noted that, food insecurity in the study area had a negative effect on household labour in terms of food production and hence increases more poverty among the households.

4.7.4 The Implications of Food Insecurity to Women

A question was asked to women during FGD's to explain the impact associated with food insecurity to their household welfare. Women participants said that, they suffered the most during times of food insecurity because of the load to find food to household members especially children and also their food intake as compared to males. The same similar findings have been reported by Gray, (1994) and Pike (1999) that, among the Ngisonyoka Turkana of Kenya, women will sacrifice eating so that their children will not suffer as much. However, the women who participated in Focus Group Discussions remarked on their overall material deprivation, the stress and anxiety imposed by seasonal food insecurity which according to them was topic of daily conversation throughout much of the time of food insecurity.

4.7.5 Households Food Insecurity and Psychological Outcomes

When conducting FGD's participants were asked to explain how food insecurity affects household members' psychological development. Participants said that, they experienced different level of psychological feelings in the period of food insecurity especially between December and March when food shortage becomes acute. The same observation was reported also by Hardley *et al;* (2007) when addressing the issue of seasonal food insecurity in rural Tanzania that, the period between January and March is a time of frequent but less intensive labour and reduced food availability as the food stocks from the prior harvest have been depleted, and therefore households experienced food insecurity leads to considerable anxiety and stress.

From these findings, apart from differential psychological outcomes, food insecurity may create social inequalities between have and have not households. For example, Hadley and Patil (2006), on their findings about the outcomes of food insecurity in rural Tanzania found that, food insecurity may be linked to poor diets, which in turn influence anxiety and depression.

4.7.6 Relationship between Food Insecurity and Households Health

During FGD's, a question was asked to participants to explain the impact of food insecurity associated with food insecurity in the welfare of their family in particular health. Participants said that, there were several health problems more prevalent among food insecure households than food secure households. That, during times of food insecurity, apart from consistence emotional stress, discussants mentioned the existence of a clear manifestation of general poor health among the households, particularly to children and the elderly. However, discussants were not able to show exactly the magnitude of food insecurity and health problems.

4.7.7 Food Bought and Borrowed by Food Insecure Households

A question was asked to respondents to explain the extent of food bought or borrowed because of food insecurity. Results showing the percentage of respondents bought or borrowed food are presented in Table 4.24.

Table 4.24: Food Bought or Borrowed by Food Insecure Respondents (n=120)

	Village				
Eating Pattern	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total %**
	Frequency	Frequency	Frequency	Frequency	(%)

	(%)	(%)	(%)	(%)	
Food bought	30(100)	30(100)	27(93.1)	14(46.7)	85.0
Food borrowed	18(60.0)	21(70.0)	22(73.3)	8(26.7)	57.5

Source: Field Data

From the Table 4.24, about 85% of households of respondents bought food because of food depletion in their households stock between June, 2010 and May 2011. Madimba and Mtendachi villages were the highest having all respondents bought food which was 100%. In Kitunguli village, 93.1% respondents bought food while Mahurunga village was the lowest as compared to the three villages by having only 46.7% indicated to buy food.

Asked if the household respondents ever borrow food to feed their household members because there was no any food left in their stock, 57.5% of all respondents showed that, they borrowed food from different sources to suffice their household food needs. The borrowing trends were noted as follows, Mtendachi 60%, Madimba 70%, and Kitunguli 73.3% while the least village in borrowing food was Mahurunga 26.7%. The scenario of the family borrowed or requested cereals from another family member or a neighbour concurred with similar findings reported by (Nanama and Souli, 2007) that, these scenarios are considered unacceptable, compromise their dignity, or erode basic assets needed to manage risk such as health, social networks, children's education, livestock reserves and seed.

A question was asked to the respondents to mention months in which they started to buy food because of depletion of food stocks at household level. Table 4.25 presents the findings.

Table 4.25: Months of Food Purchased by Food Household Respondents (n=120)

	No. of Purchasing	Households	Percentage
Sept- Oct 2010	2	2	3.9
Nov- Dec 2010	6	20	19.8
Jan- Feb 2011	18	58	57.5
Mar -Apr 2011	19	19	18.8
Total	**30**	**101**	**100.0**

Source: Field Data

Findings in Table 4.25 showed that, between September and October in 2010, about 3.9% respondents started to buy food after finishing all their food harvested and stored intended for future consumption. From November and October 2010 the number of household respondents who were food insecure and started to buy food rose to 19.8% while in January and February 2011 the number of food insecure rose to 57.5% respondents who bought food signifying the peak period of food insecurity to majority of the respondents in the study area. Between March and April 2011, the number of food insecure household declined sharply to 18.8%. This is the period in which some household begin harvesting of certain crops.

However, power of purchasing of food is largely determined by economic power of the household. Hadley *et al.* (2007) reported the same findings when studying food insecurity in rural Tanzania among the Wapimbwe and Wasukuma ethnic groups. He emphasized on the importance of foods purchased from markets in meeting household food security depends on household food income and market price.

4.7.8 Sources of Food Borrowed by Households

In time of food insecurity households employs different ways to get food including borrowing food from close relatives. In order to know the sources of borrowing, a question was asked to respondents to mention the sources of borrowing. Table 4.26 presents the findings.

Table 4.26: Sources of Food Borrowed by Food Insecure Households (n=69

	Village				
Source	**Mtendachi**	**Madimba**	**Kitunguli**	**Mahurunga**	**Total average**
Uncle	2(2.9)	0(0.0)	1(1.4)	1(1.4)	5.8
Friend	9(13.0)	21(30.4)	19(27.5)	6(8.7)	79.7
Direct parents	7(10.1)	0(0.0)	2(2.9)	1(1.4)	14.5
Total	**26.0**	**30.4**	**31.9**	**11.6**	**100.0**

Source: Field Data

The findings showed that, 79.7% respondents borrowed food from friends, 14.5% borrowed food from direct parents while 5.8% of respondents borrowed food from uncles. However, borrowing of food or money to purchase food by food deficit household respondents as one of the coping strategy is related to economic wellbeing of the provider. For example, Campbell (1999) found that, "the availability of these

options differs according to a person's socio-economic status". The probable implication of household respondents borrowing food from other sources other than from their parents or uncles could be that, the sources of help in times of food insecurity was from distant friends away from the study area because of the prevalence of food insecurity by majority in the area.

Similar findings was reported by DeRose, Messer, and Milman (1998) quoted by Hadley *et al.* (2007) when relating the level of social support, and showed that, individuals in poorer communities may enjoy less support and the support they have may be less effective. In contrast, wealthy communities may enjoy greater levels of support and when the support is needed, it may be more effective.

From this analysis of the impact of food insecurity to the household and their related welfare it was noted that, 53.2% of household was classified as food secure while 46.8% were classified as food insecure. About 67.5% households cut size of meals to children, 35% children skipped meals while 43.3% children happened not to eat for a whole day while 65.8% of adults cut or skipped meals, 59.7% did not eat proper meals and 85% bought food as the implication of food insecurity in the households between September 2010 and February 2011.

In conclusion it was noted that, the impact of food insecurity has a negative manifestation on psychological, social and economic development on family members. Among the social and psychological manifestation related to food insecurity may lead individuals to go against norms and values as well as creating enormous stress, anxiety and depression in the homes because of poor diets. In terms

of economic, food insecurity had a negative effect on household labour in terms of food production, and hence increases more poverty among the households.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

The general objective of this study was to investigate the causes of perpetual food insecurity in Mtwara Rural District. This chapter therefore summarizes the main findings and recommendations.

5.1 Conclusions

Basing on the findings analyzed in this report the conclusions is as follows:

5.1.1 Level of Knowledge about Food Security

On the level of knowledge about food security it was found that, 59.9% of respondents had excellent knowledge on the concept of food security. However, despite majority of respondents having excellent knowledge about food security 61.7% was found to reduce meals as indicator of signs of food insecurity while about 50.8% employed labour selling as coping strategies as means of addressing temporary food shortage.

It was concluded that, despite majority of the respondents having excellent knowledge on food security, that did not mean majority of households were food secure.

5.1.2 Level of Food Production at Household Level

On the level of food production at household level, 32.2% of the household had farming experience between 1 to 10 years while 30.4% had farming experience between 11 to 20 years and 19.7% had farming experience between 21 to 30 years. However, despite considerable farming experience and many years of skills in food production, the level of food production of all food crops in the study area was very

low. Further, despite production of 117,520 kg which made an excess of 29,558 kg of food produced against 87,962 kg of food requirements in 2010/2011, about 56.8% of all food harvested was sold immediately after harvest**.** Despite awareness of respondents on the importance of application of farm inputs especially chemical fertilizer's high prices of agricultural inputs contributed to low food production.

It was concluded that, poor farming technology, excessive selling of harvested food crops and high prices of agricultural inputs in the study area contributed significantly to low food production and hence food insecurity.

5.1.3 Level of Awareness on Importance of Food Security

On the level of awareness on importance of food security it was found that, 88.8% households had no advice on proper grain storage methods, 54.2% and 40% households had eaten three and two meals respectively while 5.8% had eaten single meal a day. On food consumption and importance on nutritious food 61.7% were aware on the importance of nutrition food while 38.3% were not aware. On the food identification level 62.5% knew the foods that provided nutrients while 37.5% were not aware. On the identification of nutritious food 55.8% were aware and 44.2% were not aware while on the eating habit and its effect on health 61% knew and 39% were not aware on the health implication of eating or failing to eat particular food. It was concluded that, low level of education among the household affect awareness of eating habits and had direct implication on their health.

5.1.4 Factors that Lead to Food Insecurity in the Households

Regarding factors that lead to food insecurity in the households it was found that, 75% of storage structures in use were kitchen ceiling, 24.2% polythene bags and 0.8% gourds and pots. It was also revealed that, 79.1% households did not treat food before storage while 64% did not apply any pesticides treatment in controlling pests during storage. On the amount of food losses, 79.2% households had experienced loss during storage and 33.5% of all total food stored was destroyed by pest during storage. Further, about 61.5% lost between 1-200 kg, 27.2% lost between 201-400 kg, 5.2% lost between 401-600 kg while 6.1% lost more than 601 kg of food during storage.

It was concluded that, poor storage methods and structure and poor treatment of food crops during storage was ineffective in controlling insects and pests in food storage. This resulted to loss of food stored and is one of the factors leading to food insecurity in the study area.

5.1.5 Level of Impact of Food Insecurity in the Households

On the level of impact of food insecurity in the households it was found that, 53.2% of household was classified as food secure while 46.8% were classified as food insecure. About 67.5% of the food insecure households cut size of meals to children, 35% children skipped meals, 43.3% children happened not to eat for the whole day while 65.8% of adults cut or skipped meals, 59.7% did not eat proper meals and 85% bought food as the implication of food insecurity in the households between September 2010 and February 2011.

It was therefore, concluded that, the impact of food insecurity observed has a negative manifestation on psychological, social and economic development on family members. From social and psychological perspectives, food insecurity may lead individuals to go against norms and values as well as creating enormous stress, anxiety and depression in the homes because of poor diets. From economic perspective food insecurity had a negative effect on household labour in terms of food production, and hence increases more poverty among the households.

5.2 Recommendations

Basing on the above conclusions, the following recommendations have been made.

5.2.1 Level of Knowledge about Food Security

Most of respondents had excellent knowledge on the concept of food security. However, despite that knowledge 46.8% households were found to be food insecure.

It is recommended that, Ward and District officials should continue to educate the households on knowledge about food security especially proper utilization of harvested food crops so that the problem of food insecurity could be minimized in the households.

5.2.2 Level of Food Production at Household Level

Poor farming technology, and high prices of agricultural inputs was a reason to low food production. Apart from reasonable food production, excessive selling of harvested food crops contributed significantly to food insecurity in the study area. It is therefore recommended that, agricultural extension officers and other stake holders in the district dealing with food security should put more efforts to encourage and

educate households in the study area to improve their farming system. These efforts should be taken by both local Ward agricultural extension officers and also District level in educating farmers on proper use of agricultural methods including application of modern agricultural inputs.

The government should facilitate food production by lowering prices of agricultural inputs as well as reducing taxes on agricultural implements and should increase the scope of agricultural subsidies to all food crops which will make easier availability of fertilizers and pesticides.

Finally, lack of non-farm incomes was found to cause excessive selling of harvested food crops among the households. It is recommended that, in order to ensure food security at household level, District officials should encourage households to establish local savings and credit union which will increase their financial capacity and therefore will help to create occupation diversification in the households. Also, District Council Authority should strengthen and promote rural vocational training in small technical fields as one of the means of ensuring sustainability of household income and food security at household level.

5.2.3 Level of Awareness on Importance of Food Security

The low level of education among the household in the study area was found to affect level of awareness of eating habits and had direct implication on their health.

It is recommended that, because of low level of education and awareness of food among the households, there is a need for Wards and District officials to engage the

community in the study area to raise awareness on food security and its essential value to health so as to avoid and reduce health implication associated with poor diets. These will encourage community at large to be conscious and informed about awareness and importance of the nutritional content of food and therefore will lead the households to supports eating habits of healthy food.

5.2.4 Factors that Lead to Food Insecurity in the Households

Storage structures in use in the study area were found to be ineffective in food storage. Lack and poor treatment of food before and during storage resulted to food loss.

It was recommended that, agricultural extension officers in Ward and District dealing with food security should introduce and encourage households in the study area to use improved storage structures and techniques together with educating them on importance on proper treatment of food crops during storage.

5.2.5 Level of Impact of Food Insecurity in the Households

Reducing size of meals, skipping meals and eating poor diets by household members has been found to have a negative manifestation on psychological, social and economic development on family members which includes stress, anxiety and depression in the homes because of poor diets.

In face of this, it is recommended that, there is need for the government through its Strategic Grain Reserve (SGR) to use the facility to stabilize prices in the market by releasing the grain in areas where there is food insecurity especially the poor

households whom should be targeted for food aid programs, which could be as free food or through market targeted interventions specifically meant for the poor. District agricultural officials and other government in agencies in the District should make efforts to encourage households to keep animals, to produce fruits and vegetables in home gardens in order to increase food production and the protein content of the poor households' diet so that the implications associated with food insecurity could be reduced.

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APPENDICES

Appendix I: Questionnaires on Household Head

SECTION A: Demographic Characteristics of the Household Head

1. Name:_____
2. Village:_____
3. Local government area:_____
4. Date:…… ……2011.

5	Record of sex of the respondent	Male ……1 Female……..2
6	What is your age (years)?	21-30……1 31-40……2 41-50……3 51-60……4 61 and above……5
7	Level of education	Illiterate……1 Primary……2 Secondary ……3 Higher education……...4
8	Marital status	Single……1 Married……..2 Divorced……3 Separated……...4 Widowed……...5
9	Current occupation	Farmer……1 Trading……...2 Employee……...3 Fisher……4 Unemployed……..5

10. How many members of the household?

a) 1 – 2
b) 3 – 4
c) 5 – 6
d) More than 7

11. How many of your household members fall in the following age group?
Table I

Age groups (in years)	Number of males	Number of females
0 – 4		
5 – 14		
15 – 64		
65 and above		

SECTION B: Farming system and Land use

12. How many croplands owned and operated by the household (acres)……..

13. How did you obtain your land?

1. Inheritance [ ]
2. Purchased [ ]
3. Village/government [ ]
4. Borrowed [ ]
5. Accessed free land [ ]

14. How long have you been farming…….years.

15. Mention types of major food crops do you cultivate.....

16. What is the farming technology do you use in tilling the land?

1. Hand hoe/Manual [ ]
2. Animal [ ]
3. Tractor [ ]

4. Other specify……

17. Did you use modern farm inputs? (a) Yes [ ] (b) No [ ]

18. If you did not apply farm inputs, give the reasons……..

19. How much organic fertilizer did you use for the 2010/2011 in food crops (kg)……

20. Did extension staff visit you last growing season to give you farm advice?

(a) Yes [ ] (b) No [ ]

21. If yes, how many times did extension staff visit you the cropping of 2010/2011 season?

SECTION C: Knowledge about Food Security

22. Knowledge of food security will be measured by using a 5 points hedonic scale as follows:

Table II

Statement implying knowledge on food security	**Yes**	**No**	**Scores by respondents**
1. Food security means ensuring, adequacy of food supplies in terms of quantify quality and variety of food.			
2. Food security means optimizing stability in the flow of food supplies.			
3. Food security means access to nutritionally adequate and safe food.			
4. Food security means sufficient skills to acquire, prepare and consume nutritionally adequate diet including those to meet the special need of young			

children and pregnant mothers.			
5. Food security means access to health services and a health environment to ensure effective biological utilization of food consumed.			
Total score			

Key: Yes = 1 Mark No = 0 Mark

5 - Excellent knowledge

4 - Moderate knowledge (above average)

3 -Neutral (no clear evidence of presence or lack of knowledge)

2 - Moderately ignorant (Below average)

1- Extremely ignorant (know nothing)

23. How did you feed the household during the time without food grain?

1. Use crop sales money [ ]
2. Sale livestock [ ]
3. Sell labour [ ]
4. Use dry season crops [ ]
5. Brew and sell alcohol [ ]
6. Informal sector cash (specify) [ ]
7. Others (specify)…….

SECTION E: Level of Food Production at Household Level

24. What is your food requirement to the members of the household per year (kg)?.....

25. How much food did you harvest in the 2010/2011 season (kg)

……...

26. What are your sources of food?

(a) From the household farm [ ]

(b) Purchased in the market [ ]

(c) Relatives and friends [ ]

(d) Others (specify)……..

27. Out of the total grains you harvested how much was used for the following purposes

(Specify unit of measure that is bag, tin or kilogram).

(a) Selling…….. (b) Stored (c) Consumption…… (d) Seeds……

SECTION D: Level of Awareness on Importance of Food Security

28. Did you receive any advice from the extension agent on proper grain storage practice in 2010/2011?

29. How many times per day does your family actually eat?

30. Are you aware of the importance of consuming nutritious food?

1. Yes [ ] 2. No [ ]

31. Do you know which foods provide the nutrients referred to in the recommendations?

1. Yes [ ] 2. No [ ]

32. Can you choose between different foods to identify the healthiest ones?

1. Yes [ ] 2. No [ ]

33. Do you know what the health implications of eating or failing to eat particular foods are?

1. Yes [ ] 2. No [ ]

SECTION F: Level of Factors that lead to Food Insecurity

34. Which of the following methods of grain storage do you use to store your produce?

1 Underground pits storage [ ]

2 Gourds or pots [ ]

3 Kitchen ceiling storage [ ]

4 Granaries [ ]

5 Air tight storage [ ]

6 Others (specify)……

35. Why do you prefer that method of grain storage?

36. Did you treat the production before the storage?

1. Yes [ ] 2. No [ ]

37. What types of treatment did you use to preserve grain from pest damage during storage?

1. Chemical pesticides [ ]

2. Natural deterrent [ ]

3. I did not treat [ ]

4. Lack of knowledge [ ]

38. If you did not treat your grain during storage explain why?

39. How effective was the treatment during storage

1. Not effective [ ]

2. Slightly effective [ ]

3. Very effective [ ]

40. Explain the actual losses of food because of ineffectiveness of treatment during storage in Kg?

41. Is there any new insect pest, which rendered the storage techniques inefficient for the

prevention of food losses? 1. Yes [ ] 2. No [ ]

(b) If the answer is yes, mention them……

42. During which of the following post-harvest operation did you experience a most important loss?

1= Before harvest [ ]

2= During harvesting time [ ]

3= Transport to homestead [ ]

4= During shelling [ ]

5= During storage [ ]

43. How much production did you lose during storage in kg?

44. In which month are storage losses more serious?

45. What is the estimate duration of stored food in (month)?

SECTION G: Level of Impact of Food Insecurity at Household level and Welfare

46. Does the food that you produced in 2010/2011 didn't last, and you didn't have money to buy food in the last 12 months?

1. Yes [ ] 2. No [ ]

47. What are the reasons of food insecurity in your household?

48. Did you ever cut the size of any of the children's meals because there wasn't enough food in the last 12 months? 1. Yes [ ] 2. No [ ]
49. Did any of the children ever skip meals because there wasn't enough food in the last 12 months? 1. Yes [ ] 2. No [ ]
50. Did any of the children ever not eat for a whole day because there wasn't enough food in the last 12 months? 1. Yes [ ] 2. No [ ]
51. Did you or other adults in your household ever cut the size of your meals or skip meal because there wasn't enough food in the last 12 months?
    1. Yes [ ] 2. No [ ]
52. Did you or other adults in your household ever not eat for a whole day because there wasn't enough food in the last 12 months? 1. Yes [ ] 2. No [ ]
53. Since the last harvest, did you buy cereals to feed your family because there wasn't enough at home? Yes [ ] 2. No [ ]
    If yes which months did you started to buy food??.....
54. Since the last harvest, did you ever borrow cereals to feed your family because there weren't any cereals left in any form? 1. Yes [ ] 2. No [ ]
55. If ''yes'' whom did you borrow from
    (a) Uncle [ ]
    (b) Friend [ ]
    (c) Direct parents [ ]

Appendix II: Check List for Key Informant from District Officials

1. What are the factors associated with food insecurity in the district?

2. Which does the most period that the district experience food insecurity?

3. Does district give sensitization on the importance of food storage to the villagers?

4. What are the district strategies and efforts to eliminate food insecurity?

Appendix III: Village Leaders/ Authorities

1. What is the major reason for food inadequacy in the village?

2. Which period does food inadequacy usually occur at your village?

3. Do villagers have food storage facilities?

4. Where do you get assistance of food during the time of food inadequacy?

5. What are village authority efforts in dealing with food insecurity?

Appendix IV: Guideline for Focus Group Discussions (FGD's)

(1) Farming System

(i)What is land ownership system of your area?

(ii) What are seasonal farming activities of your area?

(2) Knowledge about Food Security

(i) What do you understand the term food security? (From local perspective)

(ii) Can you tell me various signs of food insecurity?

(iii) What are the causes of food insecurity in the village?

(iv) How do you overcome the problem of food insecurity?

(3) Level of Food Production at Household level

(i) Is the production of food sufficient for the entire year?

(ii) What are the obstacles that hinder food production in your area?

(iii) What are the major causes of food insecurity in the household?

(4) Level of Awareness on Importance of Food Security

(i) Do you understand about food security awareness and its importance to household?

(ii) What are strategies in ensuring awareness and importance of food security in households?

(5) Level of Factors that lead to Inadequacy of Food

(i) Can you mention types of storage methods and structures in use in your area?

(ii) What other techniques do you use in storing food grains?

(iii)What should be done in order to reduce post harvest losses?

(6) Level of Impact of Food Insecurity at Household level

(i) What are the impacts of food insecurity in the welfare of your households?

(ii) How does food insecurity affect household members' social development?

(iii) Does food inadequacy threaten harmony in the household?